Mekelle University

College of Business and Economics

Department of Cooperative studies

Challenges and Opportunities of Local Seed Business (LSB) Development in Endamekhoni and Atsbiwemberta Weredas, Tigray, Ethiopia

By

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A Thesis

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DECLARATION

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Department of Cooperative Studies

This is to certify that this thesis entitled "**Challenges and Opportunities of Local Seed Business (LSB) Development in Endamekhoni and Atsbiwemberta Weredas, Tigray, Ethiopia,**" submitted in partial fulfillment of the requirements for the award of the degree of Master of Arts in Cooperative Marketing to the College of Business and Economics, Mekelle University, through the Department of Cooperative studies, done by **Ato Getachew Mergia Tache** (Id.No. CDANR/PR0018/01), is an authentic work carried out by him under my guidance. The matter embodied in this project work has not been submitted earlier for award of any degree or diploma to the best of my knowledge and belief.

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Signature and date_____

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DEDICATION

I dedicated this Thesis work to my adored mother w/ro Yihdega Tesfay G/Medihin for nursing me with affection and love, who lost her life as a result of the last long civil war we had in Tigray, northern Ethiopia.

Furthermore, I would like to dedicate this research work for those who have the inspiration and struggle in "**helping poor people to help themselves**" through cooperative promotion all over the world.

ABSTRACT

There are two different types of seed marketing, known as formal and informal (farmers') seed supply. The formal seed supply sector is not well developed in Ethiopia, it was able to provide only 10-20% of the actual seed demand and the remaining demand has been supplied by the farmers' seed system. The informal seed system has been contributing a lot for the existence of the majority farmers' economic performance for many centuries and still offers many opportunities for the seed security of farmers. However, the informal seed system has been performing in Ethiopia in general and Tigray in particular at individual level and not as a business; with almost no attention was given to improve the system through appropriate research and investment. The study therefore was aimed at analyzing the seed marketing challenges and investigates the Opportunities for Local Seed Business Development in Endamekhoni and Atsbiwemberta Weredas of Tigray region, Ethiopia.

The study was conducted by collecting data from primary and secondary sources of seed marketing in the region, in three sample Kebelles of Atsibiwemberta and Endamekhoni Wereda, which was selected purposively because of the existence of Local Seed Business development pilot project supportive programme. Using random sampling procedure and probability proportionate to size of the population data has been collected from 147 total farmer respondents, of which 76 from Atsibiwemberta and 81 from Endamekhoni woredas. The data was analyzed using different qualitative and quantitative statistical procedures and methods. Both descriptive statistics like mean, standard deviation, percentage, Chi-square tests and t-test etc and econometric models were employed to study the relationship between the dependent and independent variables.

A binary logit model was employed to analyze determinants of farmers' participation in seed marketing. Sixteen explanatory variables were included in the model of which age of hhh was found negatively influencing whereas hhh's knowledge, hhh's access of credit service, cooperative membership of the hhh, and hhh understanding on importance of seed business, and existence of contract seed farming practice in the

area were found significant and positively influencing farmers' participation in seed marketing.

Based on the descriptive statistics, econometric models and focused group discussions results of this study, awareness creation program, managerial and technical capacity building of the seed producer society, seed business oriented extension system designing, community based financial institution establishment, start up capital support and long-term credit access, autonomous cooperative system promotion, link seed producer societies with contract farming and market information systems, support the seed producer societies to establish marketing infrastructure facilities are suggested as potential recommendations to promote sustainable local seed business development in the study areas.

Keywords: seed marketing and LSB Development, value-chain and seed accessibility, Tigray, Ethiopia.

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ABBREVIATIONS AND ACRONYMS

ADLIS	Agricultural Development Led Industrialization Strategy,
AGPS	Seed and Plant Genetic Resources Service (FAO),
ASTA	American Seed Trade Association,
BoARD	Bureau of Agriculture and Rural Development,
BoFED	Bureau of Finance and Economic Development,
CADU	Chillalo Agricultural Development Unit,
CSA	Central Statistics Authority,
DA	Development agent/ Agricultural extension worker/
EGTA	Ethiopian Grain Trade Agency,
EIAR	Ethiopian Institute of Agricultural Research,
ESC	Ethiopian Seed Corporation,
ESE	Ethiopian Seed Enterprise,
FAO	Food and Agriculture organization.
FCUs	Farmers' Cooperative unions,
FDRE	Federal Democratic Republic of Ethiopia,
FSS	Farm-Saved Seed,
GDP	Gross Domestic Product,
HHH	Household Head
IBC	Institute of Biodiversity Conservation,
ISF	International Seed Federation,
LSB	Local Seed Business,
LSBD	Local Seed Business Development,
MDGs	Millennium Development Goals
MoARD	Ministry of Agriculture and Rural Development,
MoFED	Ministry of Finance and Economic Development,
MoIPAD	Ministry of Information Press and Audiovisual Department,
NGOs	Non-Government Organizations
NSIP	National Seed Industry Policy,
PHSE	Pioneer Hybrid Seed Ethiopia,
PTO	Patent and Trade Office,
RARI	Regional Agricultural Research Institutes,
RBoARD	Regional Bureaus of Agriculture and Rural Development,

REST	Relief Society of Tigray
TARI	Tigray Agricultural Research Institution
TCPA	Tigray Cooperative Promotion Agency,
UNDP	United Nations development program,
UNO	United Nations Organization,
US	United States,
USDA	United States Department of Agriculture,
WTO	World Trade Organization

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CHAPTER I

1 INTRODUCTION

1.1 Background of the study

Ethiopia is located at the heart of the horn of Africa; extending from latitude 33^{O}E to 48^{O}E and longitude from 3^{O}N to 14.5^{O}N, bordered by Eritrea, Djibouti, Sudan, Somalia and Kenya to the North, East West, Southern West, and South, respectively (BoFED, 2005). It has an estimated population of 74 million of which 49.5% are women (CSA, 2007). The country has a total area of 112 million ha, of which 65% is suitable for arable agriculture (Marja et al., 2008). The agriculture sector plays the leading role in Ethiopian economy. It contributes 45% of national income, more than 90% of total export earnings, major supplier of raw materials for the agro-industry sectors, 85% of employment opportunity (World Bank, 2005).

According to the Ministry of Information (2001), Ethiopia is at a low level of socio-economic development. The economy is built on subsistence and backward agriculture system, which has been suffering from structural problems for many years. FDRE rural development strategy document blamed the absence of appropriate development policies of the previous regimes as the major reason for the structural problem of the whole economy and particularly that of the agricultural sector. To solve this critical problem the current government of Ethiopia gives high priority to improve the livelihood and socio-economic conditions through increasing the agricultural production and productivity in order to ensure food security, improve rural livelihoods, and promote industrial development. In this context, seed is a key element in improving grain production, food security and rural development. Sustainable availability of good quality seed and well functioning seed marketing system is vital development issue, without which attaining the required agricultural production and productivity is impossible.

To have functional seed marketing system, integrated approach is vital at local level that could promote and strengthen farmers based institutions like farmers group, cooperative, community based seed banks and private seed companies to improve seed marketing systems through farmers' participation.

There are two different types of seed marketing systems, widely known as formal and informal (farmers'). The formal seed supply is not well developed in many developing countries, including Ethiopia (Kiros *et al*. 2009, Sperling and Cooper, 2003). In Africa, the informal seed system dominates the seed marketing. Farmers have a long tradition of producing, saving and exchanging seeds, in Uganda Small farmers are major custodians of these rich biological resources, in which more than 90% of seeds currently being used are farm saved seeds (David, 2003). In Tanzania local seed systems remain the major and most reliable seed source, less than 10 percent of farmers have access to improved seed varieties (Flora, 2006).

The proportion of seed supplied by the formal seed system is estimated to be around 10-20% in Ethiopia (Marja *et al.*, 2008). The above figures clearly indicated that in Ethiopia, as in many other countries in sub-Saharan Africa, the informal seed marketing is still the dominant system for seed supply.

In Ethiopia in general, the local seed marketing plays important role in narrowing the gap between the demand and supply of seed (Hussein, 2009). In addition to this, Hussein, explains that local seeds are produced at low cost with the local resources, easily adopted and the most preferred by the farmers because they are familiar to them and possess better quality in terms of taste as well as accessible at the needed time. However, how the seed marketing in general and Local Seed System in particular is functioning is not studied and documented in-depth in the region as well as in the two selected study areas.

Therefore, this study is designed to answer how the seed system is functioning in the case woredas? What are the challenges and opportunities for Local Seed Business (LSB) development? What strategies could be best in addressing the challenges, in order to build farmer-based well organized and autonomous seed system?

1.2 Statement of the problem

The formal seed supply sector both from the public and the private companies provide only 10-20% of the actual demand of the country and less than 5% of the cultivated area is covered by improved seed (Hussein, 2009). The remaining demand has been supplied by the informal seed supply system for the past thousands of years from

farmers to farmers, which is considered illegal by the country seed laws (Louwaars, 2009). This condition creates unproductive limitations and hinders the informal system not to flourish in the seed market. As a result, the farmers, farmer owned cooperatives, and entrepreneurs are not stimulated to enter into the seed business.

According to Kiros *et al*. (2009), even though the informal seed system offers many opportunities for improving the seed security of small-scale farmers, because of the best agronomic characteristics, built on farmer's knowledge, and fulfill the diverse needs of the households in terms of taste, drought resistance and other qualities. Kiros farther explained that the informal seed system has gone largely unrecognized, unappreciated and undocumented while the formal seed sector has been unsuccessful in meeting farmers' needs.

Various factors may hinder the efficiency of seed marketing in general and local seed marketing in Ethiopia. These factors were not studied in-depth; as a result no appropriate strategy is designed to promote the local seed marketing development in a commercial way, which in turn suppresses the Economy in general. For this reason it has been remained to be difficult to utilize local seed resources.

Therefore, this research was designed to identify how the seed system is functioning? What are the seed marketing challenges and opportunities of Local Seed Business (LSB) development? With the objective of documenting the local seed supply system and identifying strategies, which could improve utilization of the local seed resources in the selected districts of Tigray and Ethiopia at large.

1.3 Significant of the study

The Ethiopian Agricultural Development Led Industrialization Strategy (ADLIS) document clearly states that the existence of an efficient domestic agricultural commodity marketing system could stimulate and sustain growth and development in the food and agriculture sector, through providing market incentives for poor smallholder farmers in order to participate effectively and consistently in the domestic food and agriculture markets as commercially oriented farmer.

This demands an effective and efficient farmer based seed marketing that motivates farmer groups and cooperatives to produce and market seed at local level with the objective of improving the farmers' access to quality seed and transform it into commercial Local Seed Business.

To promote the farmers' seed system proper assessment of the seed marketing, analyzing the opportunities and challenges is very significant. Therefore, to recognize, motivate and document the Seed Marketing this study was planned to assess how the seed system is functioning, what motivates farmers to participate in the existing seed production and supply? What are the seed marketing challenges and opportunities for Local Seed Business Development in the study area?

So make the study contribute significant role to achieve the Local Seed Business project aimed at making the farmer based seed supply sector commercial product under farmers' leadership in the study area and also will help development institutions, actors to understand and design appropriate intervention.

1.4 Scope and Limitation of the study

This study was conducted in southern zone, Endamekhoni Wereda and in eastern zone, Atsbiwemberta Wereda of Tigray Regional state. The study was limited by finance, time, and distance between the Weredas. These limitations determined the restricted selection of the two Weredas as the locale of the study and also forced to restrict the sample size. The study focuses on assessing challenges of seed marketing and opportunities for Local Seed Business development (LSBD) in the study area, only in three Kebelles which are not representative of the whole Region. Hence, the research does not argue to provide conclusive findings on the seed marketing system and LSB opportunities in the entire Tigray Region. Even though seed marketing deal with producing, cleaning, packaging, storing, transporting, marketing and distribution of quality seed, the scope of this study limited to the seed distribution and supply aspect only due to the above mentioned constraints.

Despite the limitations of the study mentioned above the findings of this research can be of much useful in achieving the objectives of LSBD pilot project and designing possible intervention strategies for LSBD specifically to the study areas. In addition,

since it is conducted in high land areas of Tigray, the study expected to have important contribution to other similar agro-ecology of high land areas of Tigray Regional state in particular and Ethiopia in general.

1.5 Objective of the study

1.5.1 General Objective

The general objective of the research is to analyze the challenges of Seed Marketing (the seed supply sector) and investigate the Opportunities for Local Seed Business Development in Endamekhoni and Atsbiwemberta Weredas of Tigray region, Ethiopia.

1.5.2 Specific objectives

1 To understand the seed marketing system, identify the seed marketing partners and their role in the study area;
2 To examine the challenges of seed marketing (the seed supply sector) and opportunities for Local seed Business (LSB) development in the study area;
3 To study factors influencing the seed marketing and Local Seed Business Development; and
4 Suggest options for development of strategies to improve the efficiency of the seed marketing in the Weredas.

1.6 Research question

1 How is the seed marketing systems functioning and who are the seed marketing partners and their roles?
2 What are the challenges of seed marketing (seed supply) and opportunities for Local Seed Business (LSB) development in the area?
3 What factors influence the seed marketing and the Local Seed system not to function as a Business?
4 How those influencing factors and constraints can possibly be solved?

1.7 Organization of the thesis

The chapters of this thesis work organized as follows: Chapter I comprises the introduction part, which puts forward the background of the study, statement of the problem, significant and limitation of the study, objective, hypotheses, research questions. Chapter II focuses on the literature review. Chapter III emphasizes on materials and methods used for the research project. In Chapter IV, the results and discussions are presented. The focus of Chapter V is on conclusion, and recommendations. At the end, reference and appendix are provided.

CHAPTER II

2 LITERATURE REVIEW

In this chapter, the pertinent conceptual and empirical studies are thoroughly reviewed and presented. The literature review is divided into four sections. Section 2.1 deals with the theoretical and conceptual background of seed marketing. Section 2.2 emphasis on formal and local seed supply sector and seed policy worldwide. Section 2.3 focuses on formal and local seed supply sector practices, policies and constraints in Ethiopia. Empirical studies on factors that influence the dependent variable are presented in Section 2.4.

2.1 Concepts of Seed System

There are two different types of seed marketing, widely known as formal and informal (farmers') seed supply. The formal seed supply sector is not well developed in many developing countries, including Ethiopia (Kiros *et al.*, 2009).

Formal seed marketing system: is a deliberately constructed system that involves a chain of activities leading to clear products: certified seed of verified varieties, the marketing and distribution take place through a limited number of officially recognized seed outlet, (Louwaars, 1994). In the formal seed marketing there is a clear distinction between "seed" and "grain." This distinction is less clear in the local or farmer seed supply sector.

According to Sperling and Cooper (2003), the formal seed marketing is mostly subsidized in developing countries in the case of parastatal seed companies and the privet sector also not functioning competitively. Such institutions typically expected to produce certified seed in decentralized facilities.

Informal seed marketing: is the farmer saved seed marketing; activities tend to be integrated and locally organized at individual level, and the local seed supply sector embraces most of the other ways in which farmers themselves produce, disseminate, and access seed, directly from their own harvest based on their ancestors and own knowledge. Some farmers produce "seed" as special activity, but for majority there is no clear distinction between "seed" and "grain." The marketing and distribution

activity takes place through exchange and barter among friends, neighbors, and relatives; and through local grain markets (ibid, 2003).

Farmers' seed supply sector are by far the most important suppliers of seed, and are particularly important for resource-poor farmers, always available there when needed, best adapted and preferred for their natural aromatic taste. In addition, because of their variability and local specificity to needs and preferences, local seed channels (e.g. household stocks, markets and social exchange networks) provide most of the seed that most small farmers use (Sperling and Cooper, 2003).

Formal seed supply sector, on the other hand, provide tasted seed to farmers through an organized and often regulated chain that includes gene-banks, breeders, seed producers, seed marketing and distribution organizations. In practice, these different supply sectors operate side by side to serve the needs of different types of farmers for different types of crops. Both seed systems are distinct but intersecting. Interaction between these two supply sectors provide important ways of combining formal and local knowledge and plant materials, can lead to the creation of site specific solutions (Louwaars, 2007).

One sector is not necessarily "better" or more effective than the other; they meet different kinds of needs, sometimes for different environmental niches or for different types of farmers. Moreover, there are no clear or absolute divisions between the formal and local supply sector, seed and varieties can flow between them; farmers draw upon one or the other depending on need. Therefore, seed-related interventions, whether for "relief", "rehabilitation" or "development" needs to be based on an appreciation of the strengths and weaknesses of each. As several seed specialists advocate, we need to develop proactive strategies to integrate the strengths of both sectors (Almekinders and Hardon, 2000) as it was cited by Sperling and Cooper (2003).

2.2 Worldwide background of seed industry

Seed is Basis of civilizations for Babylonian and ancient Egyptians according to Hussein (2009). In Europe documented history of Seed industry began back to the 17^{th} century in England, and then expanded to France, Netherlands, Germany and the US (Dillon, 2005).

Before 1854, seeds were sourced in the U.S. by way of a small number of horticultural seed catalogs, farmer (or gardener) exchange, on-farm seed saving, that was through the informal seed supply sector. One hundred fifty years ago the United States did not have a commercial seed industry; today it has the world's largest. A nation once a 'debtor' in plant genetics now supplies the world (ibid, 2005).

The US government funded a massive movement of seed industry development from the recognition and objective of feeding an expanding continent which require a diversification of foods to attain food security.

The local seed system is dominating the world seed supply. However, for most countries there is no official statistics, how much of the world's crop area is sown to farm-saved seed (FSS), but according to GRAIN rough estimates can often be made by comparing the sales of certified seed of a crop with the total area under cultivation with that crop. That is: -

$$\% \text{ of FSS CL} = \frac{\text{TACC} - \text{ACISC}}{\text{TACC}}$$

Where

FSS CL is Farm save-seed covered land

TACC is Total area under cultivation with crop

ACISC is Area covered by improved seed of a crop (Le Buanec, 2005)

Figures compiled by GRAIN indicate that most developing countries still mainly depend on FSS, in particular regions with a large peasant farming sector, such as South Asia and sub-Saharan Africa, where typically 80–90% of planting materials are produced on farm from FSS. What is less well-known is that many rich and middle-income countries also still use considerable amounts of FSS. The International Seed Federation (ISF) in 2005 circulated a questionnaire to its seed company members, which yielded estimates from 18 mostly developed countries. Typical figures were in the 20–40% range, but for some crops and countries they were much higher. Several of the major cereal producing countries Argentina, Australia and Canada reported FSS figures from 65% all the way up to 95%. Another notable country was Poland a recent EU member and the largest agricultural power in Europe after France where FSS was reported at around 90% for all major crops except oilseed (ibid, 2005)

2.3 International and national seed policies

Germany was one of the first countries to regulate seed sales in 1905, followed by Switzerland (1913; Schneider, 2002), and the Netherlands (Federal regulations in 1924; Maat, 2001) as it was cited by McGuire (2005).

The importance of seed in agriculture, food security and rural development has made seed an issue in national and international policies. Its multiple roles, moreover, makes it vulnerable to policies that may not be directed at seed itself or even at agriculture (Louwaars, 2007).

Louwaars (2007), farther indicate that, seed issues are debated at the international level in today's globalize world. Often this leads to jointly agreed objectives, such as the Millennium Development Goals or rules laid down in conventions and treaties. Recent agreement made globally that specifically deals with seed is the International Treaty on Plant Genetic Resources for Food and Agriculture. Most international policies and institutions do not focus exclusively on agriculture, but they do have a marked effect on crop production and more particularly on seed (ibid, 2007).

From the international experience we can learn that even if the formal seed system has been promoted in an organized way for more than 100 years with the objective of supplying quality seed, remains inadequate to satisfy the demand from farmers in all countries and how much the local seed system is very important equally for both developed and developing countries in fulfilling the gap of seed demand.

2.4 Status and background of seed industry in Ethiopia

Ethiopian Agriculture is characterized by subsistence farming and small landholdings. Per capita landholdings are smaller in high land areas inhabited by the majority of farmers than in areas of low land. The national average for annual crops is only 0.8 ha (Table 1). Individual plots are fragmented into several smaller parcels (similar to Amharic word Timad) with an average of three parcels per holding. Most farmers in the northern and central highlands own even smaller areas and grow diverse crops and varieties.

Table 2.1 Area and land holdings of farmers in Ethiopia.

land use	*Area (ha)*	*Area (%)*	*No of holders*	*Average area per holder (ha)*	*Average area per parcel (ha)*
Annual Crops	8,193,391	74.2	10,151,839	0.81	0.3
Perennial Crops	667,768	6.0	5,805,161	0.12	0.09
Pastures	957,856	8.7	3,723,319	0.26	0.2
Fallow	839,949	7.6	3,278,341	0.26	0.19
Wood lands	87,053	0.8	1,486,960	0.06	0.05
Others	301,232	2.7	10,226,668	0.03	0.05
Total	**11,047,249**	**100**	**34,672,288**		**0.88**

Source: Central statistics Authority, 2007.

The use of improved seeds is at very low levels. Improved seeds were used in less than 6.8% of the total cultivated cereal crops (Table 2.2). The Ethiopian Seed Enterprise (ESE), a public enterprise which is the main provider of seeds in the country, supplies less than 20,000 tons of seed per year. For smallholder farmers, the biggest constraints are high seed price, late delivery and exacerbated by poor rural infrastructure making it hard to reach farmers in remote and isolated villages. Access to and uses of seeds are critical factors for the ability of smallholder farmers to increase agricultural production and productivity, ensuring food security and improving livelihoods (Zewdie *et al.*, 2008).

Table 2.2 Area planted with improved seeds and fertilizers in Ethiopia (2005/2006)

Crops	Total area (ha)	Area covered with			
		improved seeds		Fertilizers	
		Area (ha)	**%**	Area (ha	**%**
Cereals	8,463,080	335,369	4.0	4,330,710	51.2
Pulses	1,378,939	5,025	0.4	274,915	19.9
Oil crops	740,847	4,056	0.6	76,210	10.3
Vegetables	95,194	559	0.6	66,349	69.7
Root Crops	188,917	2,114	1.1	118,229	62.6
Others (temporary)	97,677	102	0.1	32,814	33.6
Total	**10,964,654**	**347,225**	**6.8**	**4,899,227**	**44.7**

Source: Central statistics Authority, 2007.

The formal seed supply sector aims to supply adequate amounts of seed of high quality, at the right time, place, and with reasonable prices. However, currently the share of the formal seed supply sector is estimated to be about 10-20% while the rest (80-90%) is covered by the informal supply sectors.

The formal seed supply sector started in Ethiopia five decades ago as an adhoc extension activity by academic and crop research institutions. In 1942, Jimma Agricultural College was the first to start improved seed production and distribution. As early as 1954, the Alemaya College of Agriculture (now Harremaya University) used to distribute seed to farmers, and the then Institute of Agricultural Research (now Ethiopian Institute of Agricultural Research) was made responsible when was established in 1966. Later on Chillalo Agricultural Development Unit (CADU) began to produce and supply seed to serve farmers in Chillalo "Awraja" now Aris Zone and its surroundings. Meanwhile in late sixties and early seventies, many private large-scale commercial farms flourished, which were eventually nationalized by the socialist Dergue Government (Marja *et al.*, 2008), during which in some parts of the country, the then Government established new state farms, based on socialist principles farmers' producer cooperatives were also organized and farmers' resettlement projects launched. Those developments led to increased demand of modern agricultural inputs, particularly improved seeds.

Until the Government established the Ethiopian Seed Corporation (ESC), now ESE, in 1979, there was no organized system responsible for seed supply in the country (ibid, 2008). Initially the ESE was given responsibility for supplying seed to the entire farming community through local production or imports from abroad. Although its activities skewed to the state farms and cooperatives at the expense of small farmers, the establishment of the ESE did lead to the beginning of an organized seed production and supply system. Since then, the ESE has remained the main seed producer and supplier in the formal seed marketing in Ethiopia.

2.5 Seed Policy in Ethiopia

The first National Seed Industry Policy (NSIP) was issued in 1992. The National Seed Police and Regulatory framework were realigned with the Rural Development

Policies and Strategies issued by the FDRE Government in 2001. NSIP focuses on the following five key issues: -

1. Plant genetic resources conservation and development,
2. Crop variety development, testing, and release,
3. Seed production and supply,
4. Seed import and export, and
5. Reserve seed stock.

The main objectives set by the NSIP are to: -

- Ensure the plant genetic resources collection, conservation, evaluation and use by the National Research and Development programs,
- Enhance and streamline variety development, evaluation, release, registration and maintenance,
- Develop an effective system for producing and supplying high quality seeds of important crops to satisfy the national seed requirements,
- Encourage the participation of farmers in germplasm conservation, as well as in seed production and supply system.
- Create a functional and efficient organizational setup to facilitate collaborative linkage and coordination in the seed industry,
- Regulate Seed Quality Standards, import and export, seed trade, quarantine and other seed related issues.

According to Marja *et al*. (2008), the objectives of the NSIP clearly indicate the need for encouragement of farmers in germplasm conservation, as well as in seed production and supply, transform the farmers' skill into commercialized seed supply sector through efficient organizational setup. Proclamation No. 380/2004 gave MoARD the authority to supervise and regulate all government and non-government organs dealing with seed regulation, seed production and seed distribution (ibid, 2008).

2.6 Institutions participating in seed business in Ethiopia

In Ethiopia there are both public and private organizations in formal seed supply sector, including the Institute of Biodiversity Conservation (IBC), the EIAR, the Regional Agricultural Research Institutes (RARI), Universities, ESE, Pioneer Hybrid

seed Ethiopia (PHSE), several small to medium scale private seed farms and the farmers. Other relevant stakeholders are the MoARD, Regional Bureaus of Agriculture and Rural Development (RBoARD), Ethiopian Grain Trade Agency (EGTA), Farmers' Cooperative unions (FCUs) and NGOs.

Formal seed production is mainly in the hand of the Ethiopian Seed Enterprise (ESE), which is one of the public enterprises involved in the production, seed quality control, distribution and marketing of both foundation and commercial seeds (Zewdie *et al*., 2009). The ESE has four seed farms and use contractual seed production agreement with farmers from where produce and supply seed in the market. It mainly produces under contract arrangement with farmers and commercial seed growers. Limited private companies like Pioneer Hi-Bred Seeds and some commercial seed growers are also involved in the production of limited quantity of seeds with about 8% of the total certified seed supply annually.

Variety development has long been the sole responsibility of the EIAR. Since research decentralization, the RARIs start to hand over Variety development activities in their region. Moreover, Agricultural Universities and Colleges are contributing to variety research and development.

The EIAR and RARIs produce breeder seed and parental lines; the EIAR and the ESE are responsible for pre-basic and basic seed supply. The variety release activities and mechanism is still controlled at a federal level (ibid, 2009).

Zewdie *et al.* (2009), show in their study the existence of growing demand for improved seeds against a huge shortage in the country. About 90% of certified seed is supplied by a subsidized public seed enterprise. Public sector seed supply remains inadequate to satisfy a constantly growing demand from farmers. The role of the private sector in the production and marketing of seeds is low and confined to hybrid maize seed from 25-30% (Dawit *et al.*, 2008).

A policy change is now in effect to encourage the participation of domestic and foreign companies in seed production and marketing of hybrid maize and self-pollinating crops in an attempt to address the critical shortage of improved seeds (Techane, 2007). The new strategy aimed at gradually withdrawing the public sector

from production to regulatory tasks as the private sector, Cooperatives, Community based seed banks develops and farmers' group expands to take over seed production and marketing according to Ethiopian Seed Trade Association (ESTA).

In Tigray the major stakeholders in the formal seed supply system are ESE, BoARD, TARI, Mekelle University, Cooperatives, Community based seed banks, farmers' group and different NGO's also played an important role in seed supply either by directly or indirectly assisting the formal and informal seed supply sectors, or directly distributing seed themselves. REST, Irish Aid, World Vision, IPMS/ILRI, Orthodox Church, Action Aid and CRS are some of the NGO's that are in one way or the other involved in seed supply in the region (BoARD, 2008).

Relief Society of Tigray (REST) were engaged in the establishment and technical support of community based seed bank (CBSB) for some time with the intention of seed aid in helping displaced farmers recovery, re-establish, and sustain their farming systems after the end of the civil war. The community based seed bank (CBSB) was established in 20 weredas (districts) of the region. However, these days almost all the community based seed bank (CBSB) are not functioning well due to poor management skill of the community and funding NGOs withdrawal from providing both technical and financial assistance, as a result REST decided to handover them to Cooperatives with the objective of making the local seed supply sector more sustainable (REST, 2008).

2.7 Role of Cooperatives in facilitating Seed business

Cooperatives play a vital role in seed distribution by arranging financial access for seed credit through Farmers' Cooperative Unions (FCU) and supplying the seed to farmers at their village. The Cooperatives facilitate seed supply and distribution by transporting, storing and supplying to their members and the community at village level; which has direct impact to improve productivity of the farmers. The share of FCUs in seed supply to small farmers is now growing very rapidly.

Some Cooperatives start to takeover responsibility of managing the community based seed bank (CBSB) transferred from Relief Society of Tigray (REST), which could be a good opportunity for the local seed business in the future. In Tigray there are more

than 593 Multipurpose Cooperative Societies, 371 Saving and credit Cooperative, 174 irrigation Cooperatives, 207 livestock and livestock products marketing Cooperatives, 41 consumer and 316 construction related and 123 artisan cooperatives with more than 406,377 members of which 103,355 female member beneficiaries, (TCPA, 2008).

2.8 The Local Seed Business Constraints in Ethiopia

The existing private and public companies in Ethiopia produce limited amount of seed that do not cope with the growing demand in the country due to both technical and organizational low capacity. According to Ethiopian Seed Trade Association (ESTA) annual report, over 95% of seed sources come from farm-saved seed of non-improved land races. The total seed requirement (potential demand) is estimated at 400,000 to 500,000 Metric tons of the major cereal crops, where as the seed supply is as low as less than 6% of the potential demand for all crops per year. In addition, seed production and distribution is faced with substandard seed quality, low access to credit facilities, less focus and poor extension service on quality local seed production and limited market oriented extension work, absence of local seed marketing facilities, services and equipments, absence of an organized seed system, loose coordination among stakeholders.

2.9 Seed demand, supply, and distribution in Tigray

The trend of improved seed demand, supply and distribution (utilization) has been increasing on average by 37%, 34% and 28%, respectively, for the last six years as indicated below in table 2.3.

Table 2.3. Improved seed demand, supply and distribution in Tigray

S.N	Year	Demand in Quintal	Supply in Quintal	Distribution (utilized) in Quintal	Left over in Quintal
1	1996	20,000	16,544	11,485	5,059
2	1997	30,420	22,098	16,418	5,680
3	1998	34,983	26,230	15,670	10,560
4	1999	39,504	30,364	26,920	3,444
5	2000	54,841	32,693	28,422	4,271
6	2001	87,949	62,889	34,786	28,103
Average yearly increment		**37%**	**34%**	**28%**	**27%**

Source: BoARD annual report 2001.

The demand increased every year due to the intensive extension interventions by the government to ensure food security through boosting the agricultural productivity. However, the figures in table 2.3 indicate that even though the demand increases at an increasing rate the supply is not increased equally and remains inadequate to satisfy the constantly growing demand from farmers, as the same time due to inefficient extension service, organization and arrangement of delivery, drought, increase in price and loose coordination among stakeholders, on average 27% of the supply remained unutilized as leftover stock every year.

Table 2.4. Improved seed demand, supply and distribution in Endamekhoni Woreda

S.N	Year	Demand in Quintal	Supply in Quintal	Distribution (utilized) in Quintal	Left over in Quintal
1	1996	-	-	-	-
2	1997	-	-	-	-
3	1998	2,550	2,060	1,986	74
4	1999	3,500	2,550	2,025	525
5	2000	4,600	2,800	2,404	396
6	2001	5,200	3,200	2,783	417
Average yearly increment		27%	16%	12%	

Source: BoARD 2001 annual report.

Table 2.5. Improved seed demand, supply and distribution in Atsbiwemberta Woreda

S.N	Year	Demand in Quintal	Supply in Quintal	Distribution (utilized) in Quintal	Left over in Quintal
1	1996	-	-	-	-
2	1997	-	-	-	-
3	1998	350	280	230	30
4	1999	620	418	385	10
5	2000	780	512	458	23
6	2001	1,200	806	736	70
Average yearly increment		52%	43%	49%	

Source: - BoARD 2001 annual report.

2.10 The Local Seed Business Constraints in Tigray

According to the field assessment report 2008 of Tigray BoARD, the seed supply sector of the region and the study area limited from flourishing in the area by the following main constraints and opportunities: -

Constraints

- Lack of awareness and absence of orientation of the farmers towards seed business, but farmers do seed selection before harvesting based on their experience for their own consumption.
- Inadequate and poor seed marketing infrastructure and facilities,
- Inadequate basic seed supply,
- Land fragmentation and small landholding: difficult to have required isolation distance and cluster plots.
- Fragile and high risk environment: Presence of erratic rain and recurrent drought.
- Inefficient extension service and organization, loose coordination among stakeholders on local seed sector development and promotion.

Opportunities

- Presence of high seed demands as well as existence of huge gap between the seed demand and supply for cereal crops such as wheat, Teff, etc, and vegetables seed such as potato, onion, and pulses, etc:
- Presences of strong national and regional initiatives in seed production,

- Willingness among stakeholders and their commitment towards promoting local seed business,
- Presence of development agents at Kebelle level and a cooperatives at both Kebelle and Wereda level,
- Presence of irrigation facilities for seed production.

2.11 Definition of Concepts

Local Seed: is a seed produced, disseminated under the local farmers' system, in which farmers themselves produce by selecting, choosing and testing the variety, introducing the seed, multiplying the seed, disseminating, storing and make accessible the seed based on the experience had got directly from their ancestors and own knowledge, as integral parts of farmers' production systems.

Improved Seed: is the seed developed in research institution through selection, variety choice, variety testing, introduction, seed multiplication, dissemination and monitored or controlled by government policies and regulations.

Marketing: is the process of anticipating the needs of targeted seed customers and finding ways to meet their needs profitably.

System: the organization's part/sector of an activity and way of doing the seed marketing either in the formal or farmers' marketing activities.

Local Seed supply sector: is the farmer saved seed supply. Activities tend to be integrated and locally organized at individual level, in which farmers themselves produce, disseminate, and access seed: directly from their own harvest based on their ancestors and own knowledge.

Seed Business: is a chain of activity that starts from directly planning of what seed variety to produce, how to finance, producing and marketing through integrated operated effectively and is well managed to ensure that quality seed of improved, adapted and appropriate varieties is available for sale to farmers. (MacRobert, 2009).

Seed Business: in this study is defined as the chain of activities that start from locally preferred seed selection, conservation, multiplication under farmers full participation

under seed producer cooperative, farmers group or community seed bank and selling to farmers based on their demand, as well as purchase seed from other companies and sell this directly to farmers, by acting like an agent for seed company.

Farmers group: a number of seed producer farmers that are together in the same place and connected in some way to perform common goals for common benefit.

Cooperative: The International Cooperatives alliance (ICA) defined cooperatives in 1995 as an "Autonomous Association of persons united voluntarily to meet their common economic social and cultural needs and aspirations through a jointly-owned and democratically controlled enterprise.''

Participation: - According to UNDP (1993), cited in Berhane (2008) participation refers to the close involvement of people in the economic, social cultural and political process that affect their living condition, in same cases, have complete and direct control over these process in other cases; the control may be partial or indirect. The important thing is that people have constant access to decision making and power.

In this study participation is defined as the act of taking part and involvement of farmers in an activity of seed producing and marketing in an organized manner may be under cooperatives, community seed bank and seed producer farmers group. Participation includes the involvement of farmers in seed production and marketing (1) decision making; (2) implementation of decisions; (3) monitoring and evaluation; and (4) sharing the benefits of the activities, etc.

Seed Marketing is the final step in a seed program, it takes the seed to the producer-farmers, and gets them to buy it and plant it. All seed programs operations exist only to provide high quality seed for marketing.

Seed Marketing is critically time sensitive and sensitive to so many factors affecting rural marketing. Seed must reach the farmer at the right time, place, and price, in the right amount and of the highest economic quality. Since seed Marketing is sensitive to so many factors, it has been considered as a high risk-business.

An additional problem is that during production, conditioning and handling, highly technical tasks must be performed properly on the seed crop and seed, done in the

proper sequence, and in specific critical time periods. There is further an inflexible time lag of 2-4 years from initiating stock seed production to production of the seed. Initial decisions are critical; little can be done without significant financial loss to change or reduce production after the seed multiplication program has started. Too often, good seed is produced and then stays in the storage (Gregg *et al.*, 1997). Therefore, to minimize the high risk-business nature of the seed sector, it is very crucial to implement and follow all the marketing functions and marketing principles. For this reason it is very important to understand what are the challenges of seed marketing? Why only few farmers are participating in the seed marketing, etc?

2.12 Empirical studies on seed supply and marketing

Assessing empirical studies that show factors influencing participation of farmers in agriculture and group business activities is useful to develop hypothesis for testing.

The seed supply chain will break when seed production is poorly organized and seed quality is low, which discourage farmers in seed supply and purchase participation (Gregg and van Gastel, 1997, cited in Louwaars, 2007).

In many studies, lack of farmers' knowledge on seed supply conditions and preferences, blocks the relationship between breeders, farmers and extension workers, which create negative impact on improvement of seed marketing system (Louwaars, 2007). In his study, Louwaars further mentioned that high cost of seed production; processing and stocking of improved crops reduce the availability of seed in the market or made to have high marketing cost and low marketability.

Matiya (2005), a logistic analysis of socio economic factors influencing farmers' participation in development activities, shows that sex, access to credit, landholding size were the main factors that influence people to join the fishing industries as it was cited in Kirub (2008).

Deribe (2007) found that education was one of the variables, which increases farmer's ability to acquire, process and use agricultural related information in better way. Consistent with this, Deribe (2007) found out those farmers with larger farm size, have higher possibility to use combination of technological packages.

McGuire (2005), in his study, inadequate extension services was found as the bottleneck of seed system improvement in west Harerge. Furthermore, he found that extension in Ethiopia remain hierarchical, and rarely see farmers as sources of knowledge or innovation in their own, which made communication between farmers and extension workers poor. Study in the central Ethiopia estimated that extension workers (DAs) only have contact with 10% of farmers in their area (ICRA, 1999), while other study in the west Ethiopia, found that female-headed households had almost no contact with the local DAs (ICRA, 1998, cited in McGuire, 2005).

Arumugam (1983) stated that economic status or level of income was found to have positive relationship with information seeking behavior.

McGuire (2005) farther stated that an Ethiopian seed system was highly affected with problems relating to insufficient investment and infrastructure, and low levels of management experience in both seed systems.

Wolday (2002), indicates weakness of marketing institutions infrastructure in Ethiopia; contributed for existence of poor market-based seed enterprises in rural areas. Furthermore, Wolday (2002), indicates Ethiopia's poor infrastructure, limited financial institutions, week extension services, absences of market information, excessive price and supply fluctuation greatly restrict effective market development and credit accessibility, which create negative impact on improved technology utilization and hinder farmers' productivity.

Seed access is often seen as the central element in seed security (Sperling and Cooper, 2003). Access largely depends on the assets of the farmer in question: whether or not the farmer has cash or social networks to access seed. This study shows land and physical assets were also considered as determinants of seed access: if a farmer has sufficient land to guarantee self-sufficiency and adequate storage infrastructure, he/she is likely to have sufficient seed access under most conditions.

According to Deribe (2007), age of farmers was one of the demographic characteristics hypothesized to influence agricultural information. Alexander (1985) found that age was found to have significant positive relationship with the information need. Younger farmers are more eager to know and try new technologies.

In rural agriculture-based societies, women and men manage different crops and activities (Flora, 2006).

Wolday (1994), found out that size of land holding, family size, output, and market access were the major factors that affect the households' level of marketable grain supply; this has direct relationship with seed supply as an integral part of crop production.

Study by Getaneh Wubalem and Bekabil Fufa (2007), indicates that educational level of the respondent was positively and significantly related to the probability to participate in bread wheat contract farming, as the level of education increases the ability to obtain, process and use information related to better production practices. The same study, the number of oxen owned positively and significantly influenced the probability of bread wheat contract farming participation decision. As oxen are the main source of traction power used by the farmers, the availability of more number of oxen will obviously increase the production of contracted bread wheat. In addition, this study reveal that awareness and experiences of contract farming had positive and significant value on participation decision, because know the advantages of something better than those that are less aware and experienced. The variable showed the clear superiority of contract farming in generating additional income to the farmers.

Henry *et al.*, (2005), found that Demographic characteristics, age, gender and education did not have impact on respondents' intent to patronize credit unions. However, respondents' income is significant in explaining credit union patronization intentions, as it was cited in Kirub (2008).

Frayne Olson *et al.* (1998), cited in Kirub (2008), studied how members differ from non-members about their perception of cooperatives. The statistical test indicate that members are more optimistic about cooperatives role in solving marketing problems and improving their benefits as compare to non-members which makes members to patronize with their cooperatives.

All the above empirical studies show how each factors affect participation of farmers in development process and challenges the development of efficient seed supply system in general. Based on which this study designed to examine how the Seed

marketing is functioning, what are the challenges and opportunities exist for the local seed business development. To find the root causes of the challenges in the seed business, it is very important to study why only few farmers are participating in the sector? What motivates these farmers to engage in the seed business than the non participants? Hence, to answer these questions testing hypotheses is useful based on following conceptual framework.

2.13 Hypothesis

Based on the above empirical studies the following hypotheses will be tested in this research:

- Awareness on the role of seed by household head farmers has direct influence on participation of household farmers in seed supply and opportunities for Local Seed Business (LSB) development,
- Availability of marketing infrastructures and facilities positively influences participation of farmers in seed marketing.
- Access to extension service positively influences participation of household head farmers in seed marketing.
- Distance from market positively influences participation of household head farmers in seed marketing.
- Access to credit positively influences participation of household head farmers in seed marketing.
- Farm size positively influences participation of household head farmers in seed marketing.
- The demographic characteristics of household head farmers (Age, Gender, etc) positively influence participation of farmers in seed marketing.

2.14 Conceptual framework of the study

Conceptual framework is a set of ideas that shows the relationship between the dependent and independent variables; used as a basis for making analytical discussion and conclusion on the relationship of the variables of study.

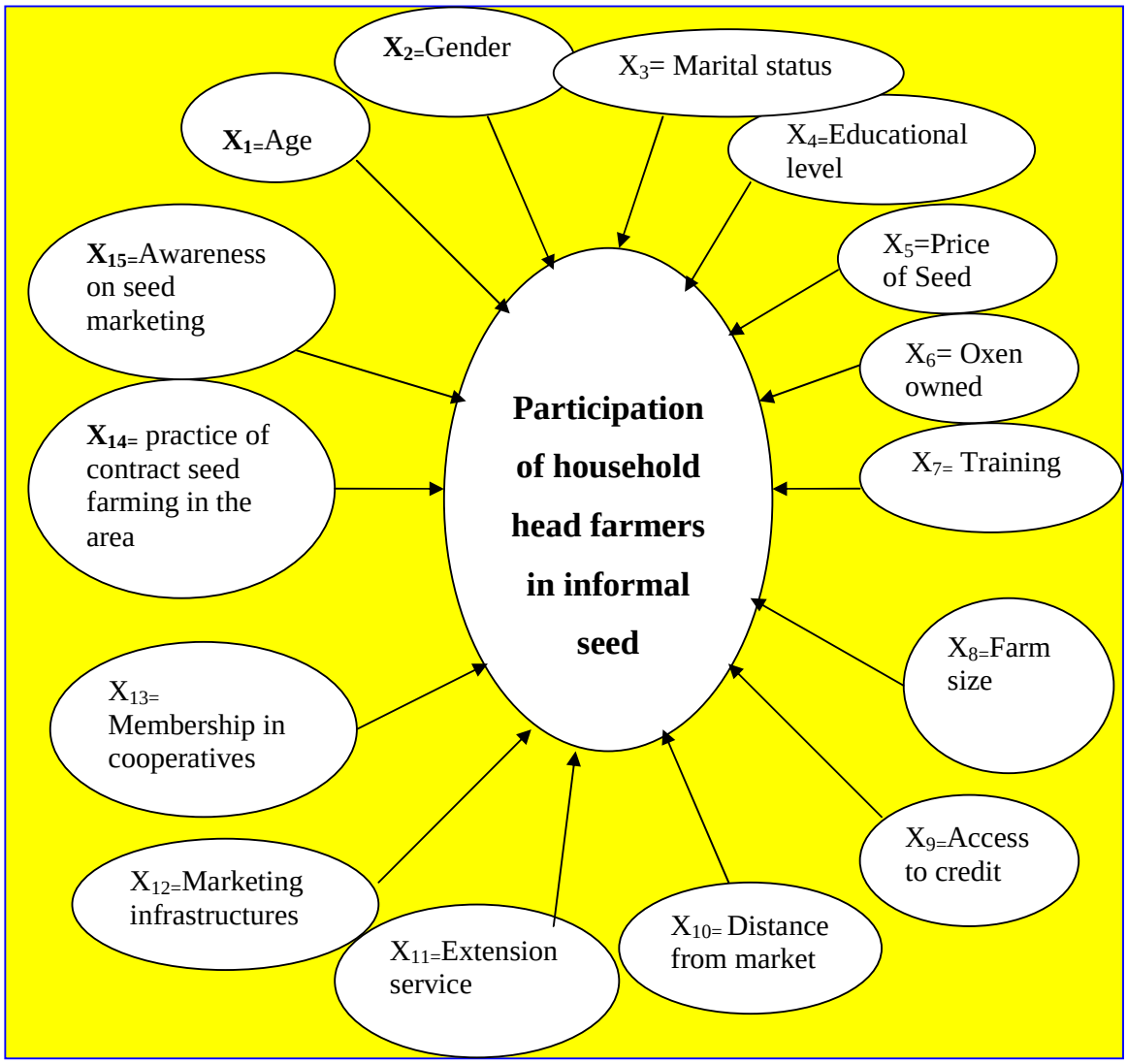


Figure 1: Conceptual Framework of variables

CHAPTER III

3 MATERIALS AND METHODS

This chapter starts by brief description of Tigray regional state and the two study Weredas namely Atsebi-Wenberta and Endamokhoni. The chapter provides the methodology adopted on such matters as sample size determination, sampling techniques followed, type of data collection methods and method of data analysis. Last but not least, variables selected for this particular study will be operationally defined and the measuring tools explained.

3.1 Site Selection and Description

3.1.1 Description of Tigray and the study areas

Tigray region is one of the nine regional states of Ethiopia, which has four administrative levels; the Regional State government, 7 Zonal administration, 34 rural and 11 urban Wereda administration and 608 rural Tabias, its capital city is Mekelle; located in the northern tip of the country; and bordered by Eritrea to the north, Sudan to the west, Afar Region to the east and the Amhara Region to the south, situated between $12^0$15' and 14^0 57' N latitude and 36^0 27' and 39^0 59' E longitude. The region has an area of 53,683 km^2 surface area (4.88% of the total area of Ethiopia). It belongs to the African dry lands, the so called Sudano-Sahelian Region (BoFED, 1998).

The Region has three Agro-Ecological Zones with altitude of Lowland 1,600 meters above sea level hot area, Mid-Highland 1,600-2,300 above sea level and Cold land 2,300-3,500 above sea level at the peak mountainous areas.

The climate of the area is characterized by scattered, inadequate and erratic rainfall (with an average annual rainfall from 800-1,300mm and the annual average temperature ranges 15-27^0c. The temperature varies from a maximum of above 30^0c in the low lands to as low as 5^0c in the high lands. The Region experiences a small shower of rain in the months of April and May and the main rain beginning of June and ends at the end of August.

The major crops cultivated include Cereal Crops: - Maize, Sorghum, teff (Eragrosits teff), barely, wheat and Millet, Legume Crops: -field peas, horse bean, lentils and chickpea.

Oil crops: - Niger seed (Guizotia abyssinica) and Sesame Seed are the dominant crops, and annual and perennial Fruit trees also available.

According to the 2007 Statistical Report of CSA, Tigray has a total population of 4,314,456 with the average annual growth rate of 2.5%; of which 2,124,853 male and 50.8% female, and 80.5 % of the total population of the region is rural dwellers, who are heavily dependent on agriculture. The region has a total of 985,654 household head out of which over 75.73%, that is 746,394 were rural household head. 95.6% of the population belongs to Orthodox Christians, 4.0% Muslim, 0.4% Catholics and 0.1% Protestant (CSA, 2007).

Population growth is high in the region; 2.5% annually (CSA, 2007) and this aggravate the already evident high pressure on land. The average land holding is estimated to be between 0.5 and one hectare among farmers. Unless accompanied by proper water availability along good farming practices and agricultural technology, low and fragmented holdings result in low output (even sometimes no). As a result, some of the farmers and rural entrepreneurs have been entering to the off-farm sector either to support their farming activity or to totally depend on it. Likewise, the expansion of urbanization leads those farmers hosted in it to drive their livelihood from urban agriculture and off-farm activities.

The CSA estimated in 2005 that farmers in Tigray had a total of 2,713,750 cattle, 72,640 sheep, 208,970 goats, 1,200 horses, 9,190 mules, 386,600 asses, 32,650 camels, 3,180,240 poultry of all species, and 200,480 beehives.

There were 70 multi-purpose stores of which 43 are with capacity of 3,000 quintal while the other 27 stores are with capacity of 5,000 quintals owned and managed by the BoARD to store the agricultural input until the distribution time; usually the inputs consist of fertilizers, insecticides, improved seed, farm and hard tools. There were 20 community based seed bank (CBSB) promoted by REST, in 20 weredas. However, due to management problem and withdraw of the funding NGOs most of

CBSB are not functioning well. This existence of agricultural input stores and CBSB could be a good opportunity for the local seed sector development in the region.

In each Weredas of the region there is responsible body to promote the establishment and operation of the agricultural activities under their purviews, within one Kebelle there are three agricultural development agents who are responsible for extension technical support to boost the Agricultural productivity including seed development but no one assigned to support and promote the marketing activities.

3.1.2 Description of selected woredas

Atsebi-Wenberta is located about 73 km north east of Mekelle, capital of the Tigray regional state, the capital of the Wereda; Endasselassie, is off the main road to the east branching at the town of Agulae, has a total area of 1,137.7 km^2 (BoFED, 2006). It is divided into 18 administrative 'Tabias' (Peasant Associations), bordered by the Afar Regional state from the east and south, Wukro in the west, Saesie-tsaeda emba Wereda in the north. According to the 2007 Statistical Report of CSA, the total population was estimated to be 112,234; of which 52.23% are female. It has also a population density of about 148.2 persons per Km^2.

The average land holding, as obtained from the Wereda office of Agriculture and Rural development, is 0.5 ha crop land; which is one of the smallest in the region.

The cultivated land accounted for 11% of the total area of the Wereda, Grazing land was 16%, and about 4% was forest land, shrub and wooldland.

Dominant Cereals of the area are wheat, barley, teff, maize, Sorghum, oilseeds such as sunflower, pulse crops such as chickpea, horse-bean, livestock and livestock products such as cattle, goat and sheep, honey, hide and skin are the most important outputs produced in abundance. Review of the area under different crops for the past five to six years shows that wheat, barley, maize, sorghum, and teff are the four most import cereal crops in the region, in terms of area coverage. (BoARD, 2008).

Agro-ecologically, it has been classified into Upper Kolla 1,500 to 1,800m Woinadogua (moderate temperature) with an altitude of 1,800 to 2,600 m above sea level and Dogua with an altitude above 2,600 m above sea level. The total coverage of

these agro-ecological zones is 40% Woinadogua and 60% Dogua. The Wereda has four seasons, which are known as “Kiremti” (rainy season), “Kewi” (cold season), “Hagay” (hot dry season) and “Tsidia” (hot rainy season), (WVE, 2003).

Atsbi Womberta Wereda has one and short rain season. The annual rainfall ranges from 300 to 600 mm. The rainy season is very short, which mostly start from 4th week of June to end of August. Annual temperature varies from 15^0c to 35^0c. But some times it drops down up to almost freezing point (BoARD, 2003).

Endamehoni Wereda is found in the southern zone of Tigray regional state. It is one of the five Weredas in southern zone of Tigray located 753 km north of Addis Ababa and about 120 km south of the Mekelle, capital of the Tigray region. It is the center of south zone and borders with Raya-Azebo in the east, ofla in the south, Alaje Wereda in the north and Amhara region from west. It has 12 Tabias (Peasant Associations) with 628.50 km^2 total area. Its number of agricultural households is 17,597. According to the 2007 Statistical Report of CSA, the total population was estimated to be 84,726; of which 50.37% are female. It has also a population density of about 134.81 persons per Km^2.

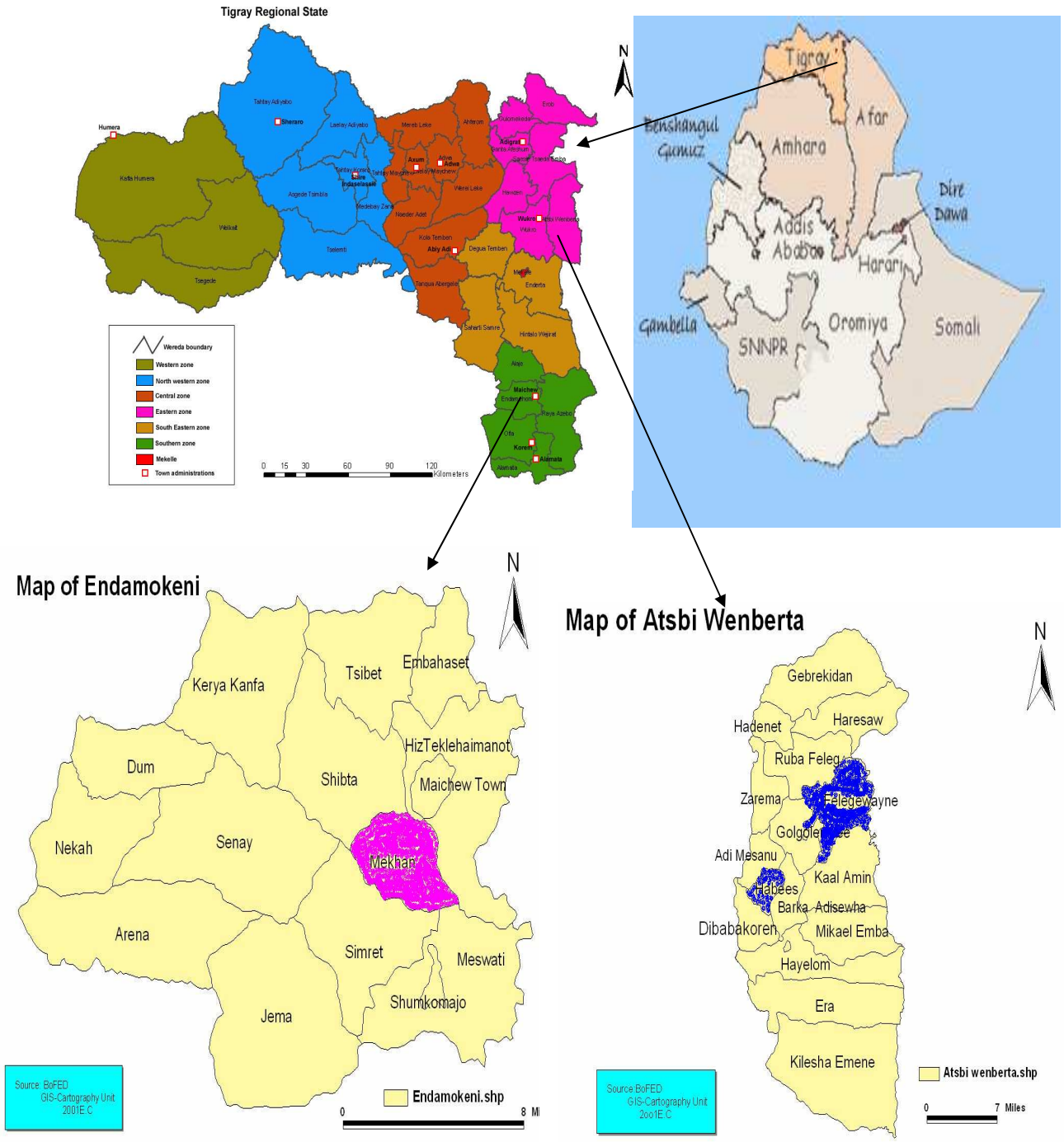
The cultivated land accounted for 17% of the total area of the Wereda, Grazing land was 19% about 3% was forest land, shrub and wooldland (BoARD, 2003).

Cereals amounted for 88% of the land covered crops: - Sorghum, teff, wheat, barley, livestock and livestock products such as cattle, goat and sheep, honey, hide and skin are the most important outputs produced in abundance. Review of the area under different crops for the past five to six years shows that sorghum, barely and teff are the three most import cereal crops in the Wereda, in terms of area coverage. (BoARD, 2004). The Wereda extensively cultivate cereals and vegetable; and raise mainly sheep and cattle.

Agro-Ecologically Endamehoni Wereda has altitude of Mid-Highland 1800-2500 above sea level and Cold land 2500-3500 above sea level at the peak Tsibet mountainous area greater than 3,500 above sea level.

The climate of the area is characterized by scattered, inadequate and erratic rainfall (with an average annual rainfall from 500mm to 900mm and the annual average temperature ranges16.5^{0}c to 20^{0}c. The Wereda experiences a small shower of rain in the months of April and May and the main rain being from June to end of August.

Figure 2. Map of the study areas in Tigray regional state.



Source: Tigray region BoFED, 2005.

3.2 Data Collection Procedures

3.2.1 Sampling Design

3.2.1.1 Sampling Method and sample size

A multistage sampling procedure was adopted to select the samples of respondents. In the first stage from 19 Weredas participating in contractual seed production activities of the entire region; two Weredas (Atsbi-wemberta and Endamokhoni Weredas) has been selected purposively based on the preference of the LSB pilot project. In the second stage from the two Weredas three Kebelles (Habes, Felegewoyni and Mekhan) was selected purposively based on the preference of the LSB pilot project from both Weredas by focusing on seed production. In the third stage, using random sampling procedure and probability proportionate to size of the population (PPS), 93 farmers, 11% of the total seed producer farmers and 54 farmers, 2% of the total households; who are not participating in seed production and supply was selected as respondent for the study from both Weredas; in sum 147 is the sample size of the study as indicated in Table 3.1. In addition seed related one official and one expert of BoARD, one cooperative expert, one Kebelle level development agents and 4 Kebelle administration representatives officials, 3 contact farmers was considered as key informant for the FGD in each sample areas.

In this study, to determine sample size, different factors were taken into consideration including research cost, time, accessibility, human and related resources constraints.

Table 3.1. Sample size of the study

Ser.N	Wereda	Kebelle	Population			Sample size		
			Total HHs	NP HHs	PSPS HHs	NP HHs	PSPS HHs	Total Sample
1	A/Wemberta	Habes	789	709	80	14	16	30
	A/Wemberta	Felegewieny	1,478	1,444	34	29	7	36
2	Endamekhoni	Mekan	1,249	548	701	11	70	81
		Total	3,516	2,701	815	54	93	147

Source: Wereda BoARD

Remark: HHs is households, NP is none-participation, and PSPS is participation in seed production and supply.

3.3 Methods of data Collection

To achieve the objective of the study both qualitative and quantitative data were collected using different tools and techniques of structured Interview Schedule among the respondents, Focus Group Discussion (FGD) with key communicators.

The structured interview schedule was designed to address questions of wide range of information, starting from demographic indicators such as age, gender, family size, to socio-economic conditions such as educational attainment, income and income sources, land holding, investment, participation in marketing organizations, training, exposure to mass media, and contact with extension agents etc.

The interview schedule first was prepared in English and translated into local language Tigrigna. The translated interview schedule was pre-tested for necessary modification and further editing has been done to ensure its clarity and completeness for generating relevant information from the respondents.

Focus Group Discussion with key communicators and questionnaire for seed related officials and experts was employed to get detail information on the issues affecting the participation of farmers in the seed marketing to supplement the data collected from sample respondents.

3.3.1 Primary Data

Pre-tested interview schedule and focus group discussion with properly reviewed checklist was used to collect both qualitative and quantitative information on the seed marketing system as first hand information.

The specific aspects on which the data collections focused on were: - existing seed marketing system, actors of the seed system, the practices of seed supply and seed contract, constraints and opportunities of the seed marketing system for the seed system.

3.3.2 Secondary Data

So as to back-up the first hand information with already existing evidence, the researcher has collected data that are relevant to the study from the following concerned bodies. Annual reports of the MoARD, ESE, Tigray BoARD, ESE branch office of Tigray, TARI and the Cooperative promotion Agency starting from the federal level to the Kebelle has been examined. In addition, seed related websites, published and unpublished reports, and research result documents from both government and non government bureaus were assessed. The data collected from these sources was include the stakeholders, annual supply and demand of the seed marketing system, and data of the beneficiary of the formal seed system, major crops of the local seed system, system of production, system of delivering the seed, challenges of the formal seed system.

3.4 Method of Data Analysis

Both descriptive statistics and econometrics model were employed to study the relationship between farmers' participation in seed marketing and explanatory variables. The result obtained is used as an indicator of the relationship between dependent variable "Participation of household head farmers in seed production and marketing" and the factors influencing participation the independent variables.

Logistic regression model is used when the response variable is a dichotomous or binary variable and the explanatory variables are continuous, categorical, or both. A dichotomous variable of the response variable takes only two values, which usually represent the occurrence or non occurrence of some outcome events that are coded as 1or 0, respectively.

The dependent variable of this study is "Participation of household head farmers in seed production and marketing" which has dichotomous nature (there is equal probability of an individual farmer to become participant or non participant). Hence, it is appropriate to apply Logistic regression model that predict the participation of household head farmers in informal seed marketing.

Therefore, For this study, the collected data was analyzed by a statistical model "Binary Logistic Regression model "using "SPSS " version 15 computer soft ware program[1]. In addition, descriptive statistics like mean, standard deviation, percentage, etc. were used.

Assessment of the farmers' participation in seed production and marketing, identifying the factors affecting the farmers' participation in seed production and marketing either through primary cooperative, farmers group and community seed banks was analyzed using Binary Logistic Regression model analysis and the results are presented in Table 4.22.

3.5 OPERATIONALIZATION OF VARIABLES

The variables selected and the main hypothesized includes in the model was explained as following: -

3.5.1 Dependent Variables

Dependent variable selected for this study was participation of household head farmers in seed production and marketing which has dichotomous nature; representing the preferred status of the farmers to participate in seed production and supply or not as a member of may be Cooperative, Community Seed Bank and farmers group. The variable takes the value of 1 if the household head is participating in seed production and marketing and 0 otherwise.

Participation: in this study is operationalzed as involvement of the farmer in the seed production and marketing.

3.5.2 Independent Variables

The following fifteen explanatory variables were hypothesized to influence the participation of farmers in Seed Marketing (seed supply sector) and opportunities for Local Seed Business (LSB) development in the study area.

[1] On Annex 1, the reason for the choice of Binary Logistic Regression model for this study has explained in detail.

- **X_1 = Age of household head (AGE)**: Age of the producer is operationalized as the number of years one has completed at the time of interview and continuous variable. Age has significant effect on developing or eroding confidence in using technologies, it is hypothesized that young people has more probability of becoming aware on marketing. Young farmers are expected to have the chance to be educated and exposed to new technology (Fetien Abay *et al.*, 2009).
- **X_2 = Gender of household head (GEN)**: is operationalized as the characteristics of the farmers in terms of male or female. Gender is a dummy variable takes value of 1 if male and 0 otherwise. Gender has momentous effect on any development issues, since women farmers in Tigray start to empower themselves economically by participating in economic activities; it is hypothesized that both male and female farmers has direct effect on seed marketing. It is expected that women's knowledge in seed selection and management would contribute towards increased richness. On the other hand, their low economic position, e.g. lack of ox and skill to plough may negatively influence their decisions in economic activities (Fetien Abay *et al.*, 2009).
- **X_3 = Marital status of household head (MRST)**: is operationalized as the status of the respondent that indicates whether the respondents are married, single, widowed, and divorced at the time of interview. Since married respondents will have more roles to be performed, a positive relationship was anticipated between marital status and knowledge of respondent in seed marketing.
- **X_4 = Education Level of household head (EDU-LEV)**: Education is operationalized as the maximum education possessed by the household head farmer, at the time of interview. This variable will be measured using formal schooling of the house hold head and hypothesized to affect marketable supply positively. Education is a crucial factor for skill development and enhancing effective production and marketing decisions. Education is a continuous variable measured as the extent to which the respondents received formal education. Therefore, it is hypothesized that education influences participation of farmers in seed marketing.
- **X_5 = Price of Seed (PR-SD)**: The value given to the farmers produce in both formal and informal seed market. This is also continuous variable measured in Birr per quintal and is expected to affect the marketable supply and utilization of

seed positively. And as a result the high price initiates the household head farmers to produce more and the low price discourages farmers to reduce their product.

- **X_6 = Oxen owned by the household head (OX)**: is operationalized as the number of the oxen possessed by the respondent at the time of interview. This is a continuous variable that will be measured with the number of oxen owned by the head of the household and expected to affect the supply and utilization of seed positively. Farmers used oxen to plough their land; it has a positive influence on productivity.
- **X_7= Training undergo in seed marketing (TR-SM)**: is the chance of the respondent that has attained any training in relation to seed marketing. Training is continues process of capacity building, which enables household head farmers to increase their knowledge and skill on seed production and marketing. Seed marketing training is expected to be positively and significantly correlated with the level of farmers' participation.
- **X_8 = Farm size of household head (FAR-S)**: is operationalized as the size of the land owned by the respondent at the time of interview. The quantity of agricultural production is limited to the availability of size of land. This variable is a continuous variable measured in terms of number of hectares. The measurement will be in relation to the actual extent of land under possession for cultivation. This has direct impact for the respondent to participate in seed production and marketing.
- **X_9 =Access to credit (AC-CR)**: Access to credit was measured as a dummy variable taking value of 1 if the household head farmer had access to credit and 0 otherwise. This variable is expected to influence the supply and utilization of seed positively on the assumption that access to credit improves the financial capacity of farmers to buy modern inputs, access to credit is expressed in terms of farmers' accessibility to production credit to purchase available input through their cooperatives or individually.
- **X_{10}=Distance from the market (DST-MRK)**: access to market is a continuous variable; measured in hours to reach the store and market centers from the household head residence. The shorter time the residence of the household to arrive the rural market center, the more is the quantity of seed supply accessibility.

Distance from market is a key factor in linking farmers with a market to sell or buy.

- **X_{11}=Extension service (EXT_SER)**: The variable extension service measured as a dummy taking value of 1 if the household head has contact with a development agent and 0 otherwise. Extension is expected to have positive effect for market participation through its stimulation of production and productivity. Farmers that have frequently contact with DAs will have better access to information and could adopt better technology that would increase their marketable supply of seed and utilization.
- **X_{12}=Marketing infrastructures (M-IFR)**: this is measured as a dummy variable taking a value of 1 if the household head farmer had access to market infrastructures and 0 otherwise. It is hypothesized to affect positively seed supply and utilization of farm households. Farmers' access to efficient and cost effective storage facilities, transportation, marketing information services is critical to their effort to integrate their economy to the market. Availability of various transport services for seed marketing will be considered.
- **X_{13}= Membership in cooperatives (M-COOP)**: This is a dummy variable which can take the value of 1 if the household head farmer is a member of local organization (cooperatives, farmer group, CBSB etc) and 0 otherwise. Membership in cooperatives is one that helps farmers to achieve volume advantage and to initiate collective action. Whether the respondent is a member of any cooperative and farmers group dealing with marketing was examined
- **X_{14}= Practice of contract seed farming (PRC-CSF)**: this is measured as a dummy variable taking a value of 1 if the household head farmer has access to contract farming information & practice, and 0 otherwise. It is hypothesized to affect farmers positively to participate or not in seed farming and marketing.
- **X_{15}= Awareness on seed marketing (AW-SM)**: is operationalized as the knowledge of the farmers on the important of seed marketing in improving their annual income and productivity and is a dummy variable which can take the value of 1 if the farmer has awareness and 0 otherwise. Awareness expected to influence the farmers' participation on quality seed production and marketing.

CHAPTER IV-

4 RESULT AND DISCUSSION

In this chapter the results of the study are presented and discussed in detail based on the results of descriptive statistics and econometrics model analysis to address the objectives of the study.

Descriptive statistics, frequency, percentage, mean standard deviation, chi-square, etc. and econometrics model analysis were examined to study the relationship between the dependent variable (participation of household head farmers in seed production and marketing) and explanatory variables, the differences in their characteristic explanatory variables, identify the existence of significant relationship between variables and measure their significance levels. Logit model was the main econometric analysis tool employed to see the factors influencing farmers' participation in seed production and marketing using Econometric software called "SPSS" version 15.

4.1 Result of descriptive statistics

4.1.1 Respondents' demographic characteristics in frequency

Various measures were made to understand respondents' socio-economics characteristics such as age, gender, marital status, level of education, family size, etc. The distribution of sample respondents based on their demographic characteristics is presented as follows as it summarized on table 4.1 below.

4.1.1.1 Gender of the Sample Respondents

The summarized Table 4.1 reveals that, 87.8 percent of the respondents were male headed, where as female headed were only 12.2 percent. From this and the marital status data revealed that females participate in rural area socio-economic activity, if only if they are responsible for the entire family as a result of divorce, the husband is dead or she is single.

4.1.1.2 Age Distribution of the Respondents

The age of the respondents who participated in the study ranged from 25 to 69. The mean age of the respondents was 45.40 years with the standard deviation of 10.396 the respondents were placed under four age categories as it is indicated in table 4.1. Majority (46%) of the respondents ranged in the age category of 31-45; followed by age group 46-55 (29%) and age group 56-70 (19%).

Table 4.1. Respondents' Demographic **characteristics (N=147)**

S.No	Characteristic	Status	Frequency	Percentage
	Gender of respondents	Male	129	87.8
		Female	18	12.2
		Total	**147**	**100.0**
	Age of respondents	Age group 18-30	10	7
	Mean = 45.40	Age group 31-45	67	46
	Std. Deviation = 10.396	Age group 46-55	42	29
	Maximum = 69	Age group 56-70	28	19
	Minimum = 25			
		Total	**147**	**100.0**
	Level of Education	Illiterate	60	40.8
		Primary school	76	51.7
		Junior school	11	7.5
		Total	**147**	**100.0**
	Marital status	Married	128	87.1
		Single	5	3.4
		Divorced	6	4.1
		widowed	8	5.4
		Total	**147**	**100.0**
	Family size	1-4	37	25
	Mean = 5.80	5-7	82	56
	Std. Deviation = 1.868	8-10	26	19
	Maximum = 10			
	Minimum = 1			
		Total	**147**	**100.0**

Source: results of descriptive statistics from own survey data

4.1.1.3 Education level of respondents

Education level of farmers is hypothesized positively to influence increase their ability of participating in adopting new technologies and benefit by utilizing local resources in a better way. The Table 4.1 indicated that 51.7% of respondents were attained Primary school, followed by 40.8% of the sample respondents were under category of illiterate, and 7.5% respondents reach Junior school.

4.1.1.4 Marital status of the respondents

The respondents were categorized into four categories namely, married, single, divorced, and widowed. The result in Table 4.1 shows that 128 (87.1%) the respondents are married and living with their wives/husbands, followed by widowed which is 5.4 percent. The result shows that the widowed are females. And the remaining 6 (4.1%) and 5 (3.4%) are divorced and single, respectively.

4.1.1.5 Family size of the respondents

In this study, the respondents were placed into five categories, as the Table 4.1 reveals respondents with family size of 5-7, 1-4, and 8-10 categories are 56%, 25%, and 19%, respectively.

Table 4.2. Respondents' socio-economics characteristics (N=147)

Characteristic	Status	Frequency	Percentage
Farm oxen holding	none	24	16.3
	1	61	41.5
	2-3	62	42.2
	Total	**147**	**100.0**
Respondents' land holding in hectare	0.25	55	37
	0.38-0.50	81	55
	0.51-1.00	11	8
	Total	**147**	**100.0**
income sources	Crop	8	5.4
	Mixed farming	103	70.1
	Mixed farming & off-farm	36	24.5
	Total	**147**	**100.0**

Source: results of descriptive statistics from own survey data

4.1.1.6 Respondents' farm oxen holding

The sample survey on the Table 4.2 indicated that about 42.2% of respondents' had 2-3 farm oxen, followed by 41.5% of respondents' had one oxen, which indicates that in general about 42.2% respondents did not face critical shortage of oxen for their farming practices.

4.1.1.7 Respondents' land holding in hectare

The results of descriptive statistics on the Table 4.2 revealed that the large proportion of respondents (54%) failed under category of 0.38-0.50 hectare and 39 percent of respondents hold 0.25 hectares of land and only 7% owned greater than 0.5 hectare of land.

4.1.1.8 Respondents' income sources

The sample survey on the Table 4.2 indicated that 70.1% of respondents' major source of there income is from mixed farming activities, followed by 24.5% generate their income from Mixed farming & off-farm activities and only 5.4% from crop production.

4.1.2 Descriptive statistics of variables

The descriptive statistics of variables was run to examine the relationship between the variables and to test the hypothesis, such as: **participation**, **age**, **gender**, **marital status**, **level of education, family size**, **Price of Seed, Oxen owned, Training, Farm size holding, Distance from the market, Extension service, Practice of contract seed farming** and **Awareness on seed marketing,** annual income and other related variables.

4.1.2.1 Age of respondents

The survey descriptive statistics result in Table 4.3; indicates that large proportion 54% of participant respondents are in the range of 31-45 age group, followed by 24% of participants under age category of 46-55 and 14% of participants found in the age range of 56-70. Pearson chi-square value (10.483) indicated that there is significant relationship between participation and age, which implies that the middle age group participates more than the young and older once.

Table 4.3. Age distribution of sample household heads (N=147)

	Non-participant		participant		X^2-value	Total	
Characteristic	**count**	**%**	**count**	**%**		**count**	**%**
Age group 18-30	2	4%	8	9%	10.483**	10	7%
Age group 31-45	17	31%	50	54%		67	46%
Age group 46-55	20	37%	22	24%		42	29%
Age group 56-70	15	28%	13	14%		28	19%
Total	**54**	100%	**93**	100%	P-value 0.015	**147**	100 %

Source: results of descriptive statistics from own survey data

** Significant at less than 5% level of significance.

4.1.2.2 Gender distributions

The survey data in Table 4.4; indicates that large proportion (90%) of participants respondents are male, only 10% participants found female. The Pearson chi-square value (1.553) indicated that there is no significant relationship between participation and gender. The data in Table 4.4 and the marital status data in Table 4.1 reveals that female participate in rural area socio-economic activity, if and only if they are responsible for the entire family as a result of divorce, or the husband is dead or she is single, which proved the conclusion that status of low economic position (lack of ox and skill to plough) affect women's economic participation, (*Fetien et al*., 2009).

Table 4.4. Gender distribution of sample household heads (N=147)

	Non-participant		participant		X^2-value	Total	
Characteristic	**count**	**%**	**count**	**%**		**count**	**%**
Male	45	83%	84	90%	1.553	129	88%
Female	9	17%	9	10%		18	12%
Total	**54**	100%	**93**	100%	P-value 0.213	**147**	100%

Source: results of descriptive statistics from own survey data

Not Significant,

4.1.2.3 Respondents' level of education

Education is a crucial factor for skill development and enhancing effective production and marketing decisions. It was hypothesized that education influences participation of farmers in seed marketing.

The survey data in Table 4.5; indicates that large proportion (69%) of participants respondents are primary(60%) and junior school(9%) educated, followed by 31% of illiterate, where as 57% of non-participants respondents are illiterate, followed by 43% of (37% primary and 6% junior school) educated. The Pearson chi-square value (9.730) indicated that there is significant relationship between participation and level of education. Therefore, it's safe to say that the differences among participant and non-participant are due to level of education variation.

Table 4.5. Respondents' level of Education (N=147)

	Non-participant		participant		X^2-value	Total	
Education	**count**	**%**	**count**	**%**		**count**	**%**
Illiterate	31	57%	29	31%		60	41%
Primary school	20	37%	56	60%	9.730***	76	52%
Junior school	3	6%	8	9%		11	7%
Total	**54**	100%	**93**	100%	P-value 0.008	**147**	100%

Source: results of descriptive statistics from own survey data

*** Significant at less than 1% level of significance.

4.1.2.4 Respondents' perception on seed price

Market price of seed expected to affect both marketable seed supply and utilization of seed positively by farmers. Hence, attractive price of seed and farmers good perception on the paid price was hypothesized to motivate farmers to produce more.

Based on the data of this survey indicated on Table 4.6; majority (64.52%) of participant respondents disagree (25.81% Strongly disagree and 38.71% disagree) and 81.48% of non-participant respondents disagree (66.67% disagree and 14.81% Strongly disagree with the sentence on Table 4.6 about attractiveness of seed price in

the area) and they believe that the seed price paid by the seed production promoting organizations (both ESE and BoARD) in their area do not motivate farmers to participate in seed production as compared with the effort needed to produce the seed and food grain, as well the FGD key informants have the same opinion (Box 1). The Pearson chi-square value (11.802) indicates that there is significant relationship between participation and farmers' seed price perception. Perception of farmers on technologies selection and use has been found positively and significantly affect farmer's decision in the studies of (Guerin and Guerin, 1994) cited by Zelalem (2007).

Table 4.6. Respondents' category in seed price perception (N=147)

Buying price of seed in your area by the seed production promoting organizations was highly motivating farmers to engage in seed production.	Non-participant		participant		χ^2-value	Total	
	count	**%**	**count**	**%**		**count**	**%**
Strongly agree	4	7.41%	7	7.53%	11.802***	11	7%
Agree	6	11.11%	26	27.96%		32	22%
Strongly disagree	8	14.81%	24	25.81%		32	22%
Disagree	36	66.67%	36	38.71%		72	49%
Total	**54**	100%	**93**	100%	P-value 0.008	**147**	100%

Source: results of descriptive statistics from own survey data

*** Significant at less than 1% level of significance.

Box 1. Result of focus group discussion (FGD) on seed price perception

Box 1. The focus group discussion at each sample villages (LSB site) revealed, the seed price paid by the seed production promoting organizations (both ESE and BoARD) in all the sample sites believed by FGD key informant not fair price, as compared with the effort needed to produce the seed and food grain, besides the key informant of the FGD believe that in an area where there is no seed market it is unfair to pay farmers 15% premium price based on the local food grain price, because both seed & food grain price are incomparable in all measurements of effort to produce, required input etc, which discourage other farmers to participate in seed business.

4.1.2.5 Oxen owned by sample members

In a country like Ethiopia, where small-scale and fragmented agricultural practice operate oxen are the most important assets of farm activities to produce marketable surplus and having farm oxen was hypothesized to influence positively participation of farmers in seed production and marketing.

The sample survey on Table 4.7 indicated that about 51% of participant respondents had two and above farm oxen, followed by 39% and 11% who had one and no farm oxen respectively, which implies that about 89.25% of participant respondents did not face shortage of oxen for their farming practices. Where as this study further indicated that the majority about 46% and 27.78% of non-participant respondents hold one and above two farm oxen respectively and more than 25% non-participant respondents had no farm oxen. More oxen unit means more asset and more asset possession leads to investment decision. The Pearson chi-square value (9.487) indicates that existence of significant relationship between participation and farm oxen holding. Therefore, it's safe to say that the differences among participant and non-participant are due to variation in oxen holding.

Table 4.7. Respondents' category in oxen holding (N=147)

	Non-participant		participant		χ^2-value	Total	
Farm oxen holding	**count**	**%**	**count**	**%**		**count**	**%**
none	14	25.93%	10	10.75%		24	16%
1	25	46.30%	36	38.71%	9.487***	61	41%
2-3	15	27.78%	47	50.54%		62	42%
Total	**54**	100%	**93**	100%	P-value 0.009	**147**	100%

Source: results of descriptive statistics from own survey data

*** Significant at less than 1% level of significance.

4.1.2.6 Land holding category of respondents

Land is an indication for wealth status in rural economy, the quantity of agricultural production is limited to the availability of land. Land size owned was hypothesized to have positive influence on participation in seed production and marketing.

The sample survey data on Table 4.8 indicated that about 62% of participant respondents had land range of 0.38-0.50 hectare, followed by 26% and 12% who had 0.25 and a land range of 0.51-1.00 hectare respectively, where as from the non-participant respondents 61% and 39% who had 0.25 and a land range of 0.38-0.50 hectare respectively. The Pearson chi-square value (20.872) indicates that there is significant relationship between participation and land ownership.

Table 4.8. Respondents' category in Land holding (N=147)

Respondents' land holding in hectare.	Non-participant		participant		X^2-value	Total	
	count	**%**	**count**	**%**		**count**	**%**
0.25	33	61%	24	26%		57	39%
0.38-0.50	21	39%	58	62%	20.872***	79	54%
0.51-1.00	0	0%	11	12%		11	7%
Total	**54**	100%	**93**	100%	P-value 0.000	**147**	100%

Source: results of descriptive statistics from own survey data

*** Significant at less than 1% level of significance,

4.1.2.7 Training undergo in seed marketing

Training expected to increase farmers' knowledge and skill on seed production and marketing. Training was hypothesized to be positively and significantly correlated with the level of farmers' participation.

The descriptive statistic data on Table 4.9 indicates that 82% of participant respondents have received seed related training, where as 100% of the non-participant respondents have never received any type of seed related training. The Pearson chi-square value (91.366) indicates that the existence of highly significant relationship between participation of farmers and training. Therefore, it is safe to say that the differences are due to the received training variation among the participant and non-participant.

Table 4.9. Respondents' category in seed based training received (N=147)

Have you obtained seed production training?	Non-participant		participant		X^2-value	Total	
	count	**%**	**count**	**%**		**count**	**%**
Yes	0	0%	76	82%	91.366***	76	52%
No	54	100%	17	18%		71	48%
Total	**54**	100%	**93**	100%	P-value 0.000	**147**	100%

Source: results of descriptive statistics from own survey data

*** Significant at less than 1% level of significance.

4.1.2.8 Credit accessibility

Credit is the most important development tool that could enable resource poor farmers to get access to modern agricultural technologies like agricultural input. This variable was hypothesized to influence the supply and utilization of seed positively on the assumption that access to credit improves the financial capacity of farmers to buy modern inputs, and practice introduced new agricultural practices.

The survey result of descriptive statistic on Table 4.10 revealed that majority of the participant respondents (93.55%) have access to credit, where as 72.22% of the non-participant respondents have no access to credit. The Pearson chi-square value (69.574) indicates that the existence of highly significant relationship between participation of farmers and credit access.

Table 4.10. Respondents' category in terms of access to credit (N=147)

	Non-participation		Participation		X^2 -value	Total	
Do you have access to credit?	No	%	No	%		No	%
Yes	15	27.78%	87	93.55%	69.574***	102	69%
No	39	72.22%	6	6.45%		45	31%
Total	**54**	100%	**93**	100%	P-value 0.000	**147**	100%

Source: results of descriptive statistics from own survey data

*** Significant at less than 1% level of significance.

4.1.2.9 Distance from the market

The shorter time the residence of the household to arrive the rural market center, the more chance to have accessibility to seed on time. Distance from market is a key factor in linking farmers with a market to sell or buy and it was hypothesized to have positive influence for expansion of agricultural production and marketing.

The survey data on Table 4.11 clearly indicates that 79.79% of the participant respondents have the shortest distance to the central market from their home, where as only 24.07% of the non-participant respondents travel for maximum of one hour, and the remaining 75.93% non-participant respondents have to travel more than one hour up to two hours to reach the central market of their district. The Pearson chi-square value (45.137) indicates that there is highly significant relationship between participation of farmers and market distance in hours. Lack of close access to seed retail points has been cited as a major limitation to farmers adopting improved varieties (MacRobert, 2009).

Table 4.11. Respondents' category in distance from market centre (N=147)

Market center distance from hh respondents' home in hours.	Non-participation		Participation		X^2-value	Total	
	No	%	No	%		No	%
0.30-1.00 hours	13	24.07%	75	79.79%		87	59%
1.01-1.30 hours	18	33.33%	5	5.32%	45.137***	23	16%
1.31-2.00 hours	23	42.59%	14	14.89%		37	25%
Total	**54**	100%	**93**	100%	P-value 0.000	**147**	100%

Source: results of descriptive statistics from own survey data

*** Significant at less than 1% level of significance.

4.1.2.10 Access to extension service

Farmers that have frequently contact with DAs will have better access to information and could adopt better technology that would increase their marketable supply of seed and utilization.

Extension was hypothesized to have positive effect for market participation through its stimulation of production and productivity.

The survey result indicated on Table 4.12 clearly show that 100% of the participant respondents had regular extension service, where as 96% of the non-participant respondents did not have any extension service related to seed production and marketing, the FGD key informants idea also support this result (Box 2). The Pearson chi-square value (138.575) indicates that there is highly significant relationship between participation of farmers and access to extension service. Extension services that promote farmer development and facilitate improvements in crop productivity will therefore probably contribute to increasing farmers' demand for seed (MacRobert, 2009).

Table 4.12. Respondents' category in terms of access to extension (N=147)

Do you have regular agricultural extension service?	Non-participation		Participation		X^2-value	Total	
	No	%	No	%		No	%
Yes	2	4%	93	100%	138.575***	95	65%
No	52	96%	0	0%		52	35%
Total	**54**	100%	**93**	100%	P-value 0.000	**147**	100%

Source: results of descriptive statistics from own survey data

*** Significant at less than 1% level of significance,

Box 2. Result of focus group discussion (FGD) on extension service

Box 2. The focus group discussion at each sample villages (LSB site) revealed that there are three development agents; assigned as agricultural extension worker for the dissemination of new agricultural technology to farmers. However, none of them have responsibility and knowledge to promote agricultural marketing services at all.

4.1.2.11 Marketing infrastructures

Farmers' access to efficient and cost effective storage facilities, transportation, marketing information services is critical to their effort to integrate their economy to the market. It was hypothesized to affect positively seed production, supply and utilization of farm households.

However, the data on the two Tables (4.13 and 4.14) and the results of Pearson chi-square values (1.979) and (.052) for both tables respectively indicate that there is no significant relationship between participation of farmers and marketing infrastructure. Therefore, it's safe to say that the differences are due to chance variation, which implies that, each participant and non-participant face the same problem of lacking marketing infrastructure. the FGD key informants share the same idea (Box 3).

Table 4.13. Respondents' access to marketing infrastructures (Car transport) (N=147)

car transport availability	Non-participation		Participation		χ^2-value	Total	
	No	%	No	%		No	%
Good	18	33.33%	42	45.16%	1.979	60	41%
some what available	36	66.67%	51	54.84%		87	59%
Total	**54**	100%	**93**	100%	P-value 0.160	**147**	100%

Source: results of descriptive statistics from own survey data

Not Significant.

Table 4.14. Respondents' access to marketing infrastructures (Transport cost) (N=147)

car transport cost	Non-participation		Participation		X^2 –value	Total	
	No	%	No	%		No	%
Fair	19	35.19%	31	33.33%	.052	50	34%
not Fair	35	64.81%	62	66.67%		97	66%
Total	**54**	100%	**93**	100%	P-value 0.819	**147**	100%

Source: results of descriptive statistics from own survey data

Not Significant,

Box 3. Result of focus group discussion (FGD) on marketing infrastructure

Box 3. The focus group discussion at each sample villages (LSB site) discovered that lack of **marketing infrastructure and facilities** such as lack of storage facilities, lack of fair agricultural product transportation, lack of reliable marketing information services are the main bottleneck that discourages farmers from participating in marketing activities as a group.

4.1.2.12 Membership in cooperatives

Membership in cooperatives is one that helps farmers to achieve advantage of economic scale and to initiate collective action.

Membership in cooperative was hypothesized to promote participation of farmers in Agricultural marketing. However, the survey result on Table 4.15 indicates that majority of both the participant respondents (86.02%) and non-participant respondents (74.07%) are members of different kind of cooperatives. The results of Pearson chi-square values (3.252) indicate that there is no significant relationship between participation of farmers and membership in cooperatives. The FGD key informants idea also support this result (Box 4)

Table 4.15. Respondents' category in terms of membership to cooperatives (N=147)

Are you a member in any Cooperative? if no, skip to question 97)	Non-participation		Participation		X^2 -value	Total	
	No	%	No	%		No	%
Yes	40	74.07%	80	86.02%	3.252	120	82%
No	14	25.93%	13	13.98%		27	18%
Total	**54**	100%	**93**	100%	P-value 0.071	**147**	100%

Source: results of descriptive statistics from own survey data

*** Significant at less than 1% level of significance,

Box 4. Result of focus group discussion (FGD) on membership in cooperatives

Box 4. The result of focus group discussion at each sample villages (LSB site) revealed that the multi-purpose cooperatives in the sample sites without supplying agricultural input to farmers once in a year, they did not practice members' product collection and marketing due to **limited managerial capacity** such as poor business management skill, limited exposure of cooperative leaders, and **lack of marketing infrastructure and facilities** such as lack of agricultural product storage facilities, lack of transportation, and lack of reliable marketing information services, as a result the cooperatives did not able to motivate farmers to participate in agricultural marketing activities as cooperative members.

4.1.2.13 Practice of contract seed farming

Knowing about existence of contract seed farming practice in the area was hypothesized to affect farmers positively to participate or not in seed marketing.

The result of this study on Table 4.16 also confirms majority of non-participant respondents (64.81%) had no knowledge about the existence of contract seed farming practice in their area. The results of Pearson chi-square values (30.623) indicate that there is significant relationship between participation of farmers and knowing the existence of contract seed farming practice in the area. Therefore, it is safe to say that the differences are due to knowledge variation about the existence of contract seed farming practice in the area, among participant and non-participant farmers. The FGD key informants idea also support this result (Box 5)

Table 4.16. Respondents' category in terms of knowing existing practice (N=147)

Is there practice of contract seed farming system in your area?	Non-participation		Participation		X^2-value	Total	
	No	%	No	%		No	%
Yes	19	35.19%	75	80.65%	30.623***	94	64%
No	35	64.81%	18	19.35%		53	36%
Total	**54**	100%	**93**	100%	P-value 0.000	**147**	100%

Source: results of descriptive statistics from own survey data

*** Significant at less than 1% level of significance.

Box 5. Result of focus group discussion (FGD) on practice of contract seed farming system

Box 5. The result of focus group discussion at each sample villages (LSB site) revealed that, the extension workers only introduce contract seed farming for few farmers at individual level based on their previous agricultural practices and early adoption for new agricultural technology, as a result most farmers in all sites had no knowledge about practice of contract seed farming system, as a result did not able to participate in seed marketing, exactly confirms the chi-square result indicated on the above table.

4.1.2.14 Awareness on seed marketing

Having good knowledge on the importance of seed marketing improves farmers' participation and productivity. Awareness was hypothesized to influence the farmers' participation on quality seed production and marketing.

The survey data on the Table 4.17 clearly indicates that majority of the non-participant respondents (72%) found had no knowledge about the existence of seed producer society in their area. The results of Pearson chi-square values (72.787) also indicate that there is significant relationship between participation of farmers and awareness.

Table 4.17. Respondents' category in level of awareness (N=147)

Do you know the existence of seed producer society?	Non-participation		Participation		X^2 -value	Total	
	No	%	No	%		No	%
Yes	15	28%	88	95%	72.787***	103	70%
No	39	72%	5	5%		44	30%
Total	**54**	100%	**93**	100%	P-value 0.000	**147**	100%

Source: results of descriptive statistics from own survey data

*** Significant at less than 1% level of significance,

In-addition to the above justification, the data on Table 4.18 also support the hypothesis that awareness has direct positive relationship with participation, according to this table 61% of the non-participant respondents replied that they had no

information about the seed producer society's objective and advantage. The result of Pearson chi-square values (113.978) also confirms that there is significant relationship between participation of farmers and awareness.

Therefore, from the above explanations of the survey it is safe to say that the differences in participation of farmers in seed marketing are due to awareness variation among the participant and non-participant respondents.

Table 4.18. Respondents' category in terms of constraints (N=147)

Constraints which prevent you from becoming member of seed producer society.	Non-participation		Participation		X^2 –value	Total	
	No	%	No	%		No	%
I do not have any information about the seed producer society	33	61%	10	11%		43	29%
I don't have spar land for seed production	12	22%	0	0%	113.978***	12	8%
the seed producer society doesn't allow to join new members	9	17%	0	0%		9	6%
Not Applicable/NA/	0	0%	83	89%		83	56%
Total	**54**	100%	**93**	100%	P-value 0.000	**147**	100%

Source: results of descriptive statistics from own survey data

*** Significant at less than 1% level of significance.

4.1.2.15 Access to on time seed supply

The inefficient capacity of improved seed suppliers was hypothesized to affect farmers' participation in seed marketing.

The descriptive statistic result of this study on Table 4.19 confirms that majority of non-participant respondent farmers (64.81%) had no on time seed supply access, where as about 71% of participant respondent farmers confirm that they had on time access for seed. The result of Pearson chi-square values (17.936) also confirms that there is significant relationship between participation of farmers and on time access to seed.

Therefore, from the above explanations results of the survey it is safe to say that the differences in participation of farmers in seed marketing are due to variation in on time access for seed among the participant and non-participant respondents. The FGD key informants idea also support this result (Box 6)

Table 4.19. Respondents' category in terms of access to on time seed supply (N=147)

Do you get on time seed supply, if you need from formal suppliers?	Non-participation		Participation		X^2-value	Total	
	No	%	No	%		No	%
Yes	19	35.19%	66	70.97%	17.936***	85	58%
No	35	64.81%	27	29.03%		62	42%
Total	**54**	100%	**93**	100%	P-value 0.000	**147**	100%

Source: results of descriptive statistics from own survey data

*** Significant at less than 1% level of significance.

Box 6. Result of focus group discussion (FGD) on access to on time seed supply

Box 6. The result of focus group discussion at each sample villages (LSB site) supports the result of the above descriptive statistics, the key informants agree that, every year seed supply in their area was delayed and farmers did not able to get demanded seed from the formal seed supplier on time with unknown reason, in addition the supplied seed were fake, had problem of quality, specially been seeds, as a result farmers made big losses.

4.1.2.16 Major problems in seed marketing

Based on the result of the descriptive statistics on Table 4.20 indicates that majority of non-participant respondents (85%) believed that fluctuating market price and absence of secured market are the major problems that discourage farmers from participating in seed business. The result of Pearson chi-square values (14.924) also confirms that there is significant relationship between participation of farmers and secured market and price.

Therefore, from the above explanations results of the survey it is safe to say that the differences in participation of farmers in seed marketing are due to having secured

market variation among the participant and non-participant respondents. The FGD key informants idea also proved this result (Box 7)

Table 4.20. Good reasons of respondents' on major problems in seed marketing (N=147)

Major problems in seed marketing in the study area.	Non-participation		Participation		X^2-value	Total	
	No	%	No	%		No	%
Unfair seed price paid by ESE & BoARD	0	0.00%	20	21.51%		20	14%
Fluctuating market price & no secured Market	46	85.19%	56	60.22%	14.924***	64	69%
no organized local seed marketing practice	8	14.81%	17	18.28%		25	17%
Total	**54**	100%	**93**	100%	P-value 0.001	**147**	100%

Source: results of descriptive statistics from own survey data

*** Significant at less than 1% level of significance.

Box 7. Result of focus group discussion (FGD) on major problems in seed marketing.

Box 7. The result of focus group discussion at each sample villages (LSB site) supports the result of the above descriptive statistics, the key informants agree that, absence of secured market and fluctuating price, absence of organized storage and distribution system, challenges of climate change such as drought, are the major problems that discourage farmers from participating in seed business.

4.1.2.17 Major seed suppliers of the study are

Based on the result of the descriptive statistics on Table 4.21 indicates that majority of participant respondents (61%) know that the major supplier of improved seed in the study area where BoARD and ESE, where as majority non-participant respondents (63%) have no idea who supply improved seed to their area. The result of Pearson chi-square values (16.248) also confirms that there is significant relationship between participation of farmers and knowing source of seed.

Table 4.21. Respondents' on major seed suppliers of the study area (N=147)

Who are the major improved seed suppliers in your area?	Non-participation		Participation		X^2-value	Total	
	No	%	No	%		No	%
BoARD & ESE	20	37%	57	61%	16.248***	77	52%
TARI	0	0%	16	17%		16	11%
REST & Mekelle university	0	0%	20	22%		20	14%
I have no idea	34	63%	0	0%		34	23%
Total	**54**	100%	**93**	100%	P-value 0.000	**147**	100%

Source: results of descriptive statistics from own survey data

*** Significant at less than 1% level of significance.

Box 8. Major seed suppliers of the study area as per focus group discussion (FGD).

Box 8. The result of focus group discussion at each sample villages (LSB site) supports the result of the above descriptive statistics, the key informants identified that, BoARD, and ESE through cooperatives are the main seed suppliers, in all the study areas, and World vision, TARI, Mekelle university and TDA were the main supporter of seed supply through both technical and financial support in Atsibi Wemberta wereda, on the other hand REST and TARI only were involved in both technical and financial support in Endamkhoni wereda.

4.2 Identifying factors influencing farmers' participation in seed marketing

To analyze factors influencing farmers' participation in seed marketing, the data collected from 147 sample respondents of the three sample areas were subjected to binary logistic regression analysis using SPSS (version 15.0). The logit model was selected for analyzing the influencing factors because of the dichotomous nature of the dependent variable. Before running the logit regression model, both continuous and categorical explanatory variables were checked for the existence of multi-collinearity problem among them using VIF and Contingency Coefficient (CC) tests to identify variables with less or no serious multi-collinearity. Multi-collinearity is the undesirable situation where the correlations among the independent variables are

strong. The situations where the explanatory variables are highly inter correlated is referred as multi-collinearity (Maddala,1992).

Variance Inflation Factor (VIF) was computed to detect the problem of multi-collinearity for significant continuous explanatory variables based on t-test. Since, the VIF values for continuous variables were found to be very small; less than 10, indicating that no serious or absence of multi-collinearity between explanatory variables (Appendix Table 2).

The contingency coefficients (CC), which measures the association between various discrete variables based on the chi-square, were computed to check the degree of association among the significant categorical explanatory variable. The value of CC ranges between 0 and 1, zero indicating no associations between the variables and the value close to one indicating a high degree of association. The result of contingency coefficients (CC) test in this study shows minimum value of 0.012 and maximum value of 0.639 (Appendix Table 4) which are less than 0.75, indicates that all the variables have no serious multi-collinearity effect between the variables.

Therefore, to determine the explanatory variables that are good predictors of farmers' participation in seed marketing, Binary Logistic regression model was estimated using the Maximum Likelihood Estimation Method. The model results show that the logistic regression model correctly predicted 93.9% of the total sample. In this analysis to find the significant explanatory variables whole model was run at first using sixteen variables with enter method. However, no variable was found significant, the research followed techniques of remove the most insignificant variables and run the model until the significant variables is found, by applying the statistical rule of "a variable whose significance value is large (i.e., greater than 0.10) should be removed". Based on which ten explanatory variables were remained in the model to explain farmers' participation in seed marketing of sample household respondents. Out of which, six variables were found to be significant, while the remaining four were non-significant in explaining the variations in the dependent variable as it is indicated on Table 4.22.

Variables such as age of the household respondents (**Age**), land holding of household respondents (**Land holding**), literacy level of household head respondents (**Literacy**),

farm oxen holding of household respondents (**Oxen holding**), respondents knowledge about existence of seed producer society in the area (**Knowledge**), existence of contract seed farming practice in the area (**contract seed farming**), access of household respondents to market information (M**arket information**), access of household respondents to credit service (**Credit access**), cooperative membership of the household respondents (**Cooperative membership**), and household respondents understanding on importance of seed business for income improvement (**Seed business importance**) were included in logit analysis as important factors influencing farmers' participation in seed marketing in the study area.

Of which six independent variables: - respondents knowledge about existence of seed producer society in the area (**Knowledge**), access of household respondents to credit service (**Credit access**) found significant at less than 1%, age of the household respondents (age), cooperative membership of the household respondents (**Cooperative membership**), and household respondents understanding on importance of seed business for income improvement (**Seed business importance**) found significant at less than 5%, and existence of contract seed farming practice in the area (contract seed farming) were found significant at less than 10% in influencing farmers participation in seed marketing, as it is shown on Table 4.22. Where as land holding of household respondents (Land holding), literacy level of household head respondents (Literacy), farm oxen holding of household respondents (Oxen holding), and access of household respondents to market information (market information) were found not significant.

Table 4.22. Logistic regression estimation of farmers' participation on seed marketing

S.No	Explanatory variables	B	S.E.	Wald	Sig.	Exp(B)
1	**Age**	**-.204**	**.089**	**5.231**	**.022****	**.816**
2	Land holding	5.234	3.395	2.376	.123	187.588
3	Literacy	-.256	1.023	.063	.802	.774
4	Oxen holding	1.196	1.375	.756	.385	3.306
5	**Knowledge**	**3.439**	**1.209**	**8.092**	**.004*****	**31.170**
6	**Contract seed farming**	**1.727**	**.943**	**3.351**	**.067***	**5.623**
7	market information	20.173	5084.35	.000	.997	577019971.71
8	**Credit access**	**5.357**	**1.672**	**10.263**	**.001*****	**212.122**
9	**Cooperative membership**	**3.013**	**1.280**	**5.537**	**.019****	**20.339**
10	**Seed business importance**	**2.807**	**1.418**	**3.917**	**.048****	**16.558**
	Constant	-5.456	3.372	2.618	.106	.004
	Overall percentage correctly predicted					93.9
	Chi-square value					157.705***
	-2 Log Likelihood					35.608
	Sample size					147

Source: Model output

*, ** and ***, significant at 10, 5 and 1 per cent probability level, respectively

Age of household (AGE): this variable took the expected sign and its coefficient was significant at 5 per cent probability level. This variable has an important influence on the participation of the household head in seed production and marketing. It had a negative and strong relationship with the participation of household head farmers in informal seed production and marketing, showing that young and mid age farmers were willing to take decision for participation than older farmers. A possible explanation for a negative relationship is that normally older people refused new ideas; they want to keep what they knew already. On the contrary, young and middle aged groups due to long-term and ambition future plan, they are expected to undertake risks. Adopters are relatively younger and middle aged farmers (Dasgupta, 1989) cited by kirub (2008), and (Fetien Abay *et al*. 2009) said that young farmers are expected to have the chance to be educated and exposed to new technology.

Knowledge about existence of seed producer society in the area (Knowledge): - the result of the logit model show that this variable positively affects farmers'

participation in seed marketing and found significant at less than 1% probability level. The positive relationship indicates that odds ratio in favor of the probability of being involved in seed production and marketing increases as the know how of the farmer increases. The justification for this could be a farmer with good knowledge of existing business is more likely to be motivated to participate in that business.

Therefore, the model result suggests that the probability of being participating increases with having good knowledge and understanding of the advantages. In many studies, lack of farmers' knowledge on seed supply conditions and preferences blocks the relationship between breeders, farmers and extension workers, which create negative impact on improvement of seed marketing system (Louwaars, 2007).

Existence of contract seed farming practice in the area (Contract seed farming): - the result of the logit model show that this variable positively affects farmers' participation in seed marketing and found significant at less than 10% probability level. The positive relationship indicates that odds ratio in favor of the probability of the farmer being involved in seed production and marketing increases as the practice of contract seed farming expands in outreach. The justification for this could be as the outreach of contract seed farming practice expands to farmers, the farmers' knowledge about seed business is more likely to be improved and motivate them to participate in that business. Therefore, the model result suggests that the probability of being participating increases with contract seed farming practice expansion in the area.

Access of household to credit service (Credit access): - the result of the logit model show that this variable positively affects farmers' participation in seed marketing and found significant at less than 1% probability level. The positive relationship indicates that odds ratio in favor of the probability of the farmer being involved in seed production and marketing increases as the access of credit increases keeping all other factors constant.

Farmers often face cash constraints to invest in land and purchase new technological inputs, in this context credit is one of the financial services help farmers to pay all their financial obligations related to production, having access to credit motivate farmers to improve their income by investing and participating in new technology

adoption. Wolday (2002) indicates Ethiopia's poor infrastructure, limited financial institutions greatly restrict effective market development and lack of credit accessibility create negative impact on improved technology utilization and hinder farmers' participation in productive activities.

Cooperative membership of the household (Cooperative membership): - as it was hypothesized this variable in the logit model found positively influences farmers' participation in seed marketing and significant at less than 5% probability level.

Membership in cooperative was one of the most important factors that were assumed to affect intensity of participation positively. If cooperative membership helps the farmers to get important services of agricultural production, the individual is likely to participate more intensively in group business. The result of the logit model supports this assumption in that membership in cooperative is positively and significantly influences extent of farmers' participation in seed marketing in the study area (significant at 5% level). Functional grain markets or value-adding grain-based industries at community level act as a stimulant to crop production intern underpin seed business growth.

Household respondents understanding on importance of seed business for income improvement (Seed business importance): - households' good understanding on the importance of seed business in improving income level showed positive influence on farmers' participation in seed marketing and statically significant at less than 5% probability level. That means as the understanding of household improved, the rate of participation of farmers in seed marketing increases; keeping all other factors constant. The more farmers hear of and become familiar with new varieties, the more likely they are to purchase seed of the improved varieties (MacRobert, 2009).

The findings of this study summarized and discussed as follows

Respondents knowledge: - majority of the farmers found that did not knew about existence of seed producer society in the area, as a result very few farmers who have information about seed business were motivated to participate in seed production and marketing in the study area, indicating that the probability of being involved in seed

production and marketing increases as the know how of the farmer on business increases. The justification for this could be a farmer with good knowledge of existing business is more likely to be motivated to participate in that business.

Contract seed farming practice: - this practice of contract seed farming found in the study area as new farming activity and practiced by very few model farmers, indicating that the probability of the farmer being involved in seed production and marketing increases as the practice of contract seed farming expands in outreach. The justification for this could be as the outreach of contract seed farming practice expands to farmers, the farmers' knowledge about the importance of seed business is more likely to be improved and motivate him/her to participate in that business.

Access of household to credit service: - credit service access was found that motivates farmers to be involved in productive business activities such as seed production and marketing. The possible reason for this positive relationship could be farmers often face cash constraints to invest in land and purchase new technological inputs, in this context credit is one of the financial services help farmers to pay all their financial obligations related with agricultural production. Therefore, it is safe to conclude that having access to credit motivate farmers to improve their income by investing and participating in new technology adoption.

Cooperative membership of the household: - farmers who involved in cooperative activities as member found to have active participation in seed marketing. The possible justification for this positive relationship could be cooperative members might have better exposure to group business and cooperative membership helps the farmer to get important services of agricultural input easily and at the needed time.

Household understanding: - good understanding on the importance of seed business in improving income level of the household found as the main motivating factor for farmers to participate in seed marketing. Therefore, it is safe to say that as the level of farmers' understanding on the importance of seed business in improving their income improves, the rate of participation of farmers in seed marketing could be increase.

Fluctuating market price and absence of secured market: - the result of the descriptive statistics shows that fluctuating market price and absence of secured

market are the major problems that discourage farmers from participating in seed business. Therefore, from this explanation result of the survey it is safe to say that the differences in participation of farmers in seed marketing are due to having secured market variation among the participant and non-participant respondents.

Extension service: - The descriptive statistics survey result also clearly indicates that farmers who have frequent contact with development agents secured better access to information and could adopt better technology that would increase their marketable supply of seed and utilization. Therefore, it is safe to conclude that farmers who have regular extension service, more likely to be motivated to participate in productive activities such as seed production and marketing.

Seed related training: - the descriptive statistical result of this study indicates that farmers, who received seed related training, were highly motivated in seed production and marketing in the study areas. Therefore, it is safe to conclude that, training improves motivation of farmers to participate in seed production and marketing.

Education: - In addition the descriptive statistics result of survey data shows majority of the participant farmers were attended formal primary education than the non-participant farmers in the study area. Therefore, it's safe to say that education improves motivation of farmers in adopting new agricultural technologies such as adopting and practicing seed production and marketing as a business.

Distance to the central market from their home: - the descriptive statistics result of survey data in this study shows majority of the participant farmers were need to travel for short hour to reach the central market from their home; a maximum of one hour single trip, than the non-participant farmers. Therefore, it's safe to say that the shorter the distance of the marketing center from the farmers' home, the more likely to be motivated to involve in business activities such as seed production and marketing as a business. Lack of close access to seed retail points has been cited as a major limitation to farmers adopting improved varieties (MacRobert, 2009).

CHAPTER V

5 CONCLUSION AND RECOMMENDATION

5.1 CONCLUSION

In this study, both descriptive statistics and econometric analysis (binary logistic regression) were employed for analytical purpose using SPSS (version 15 software).

The first objective of this study, identifying seed marketing partners and their role in the study area was addressed by examining secondary data of annual report of BoARD, TCPA and ESE from both the study area Woredas and the Region, as well as holding focus group discussion with key informants. Accordingly, BoARD and ESE through multipurpose cooperatives were found the main seed suppliers and World vision, TDA, REST, TARI as well as Mekelle University were found the main institutions that support the seed system in study areas through capacity building in both technical and financial aspects.

The second and third objectives of the study examine the challenges of seed marketing (the seed supply sector) and study factors influencing the seed marketing and Local Seed Business Development opportunities was addressed using descriptive and logistic regression analysis. Accordingly, the lesson of this research on challenges and factors influencing the seed marketing are discussed as follows.

The findings of descriptive statistics, econometric analysis and FGD in this study clearly shows that lack of farmers awareness about seed business, low contract seed farming practice due to poor extension system were found as the main factors influencing farmers' participation of farmers in seed production and marketing, this is in line with the empirical literature (Wolday, 2002; McGuire, 2005; Matiya, 2005; Getaneh Wubalem and Bekabil Fufa, 2007). Of course, farmers produce seed every year as part of their food grain production for their own consumption, but they do not produce seed purposefully for selling except the model farmers involved in contract seed farming with ESE and BoARD. The outreach of contract seed farming was found small and introduced for very few model farmers.

The other important finding of this study was inconvenient access to credit, both statistical analysis and FGD discussion shows majority farmers highly influenced by poor access to credit, similar with the finding of (Wolday, 2002), according to the FGD most of the time the credit access was attached with other development obligations, such as a farmer if he/she does not participate in one of the food security packages it is difficult to access credit, that makes access to credit inconvenience for most farmers.

The FGD shows that Agricultural product markets are poorly developed and farmers have no linkage with direct consumers, no cooperatives found involved in improving members product linkage with market due to poor capacity. For instance, the potato seed producers of Atsibi Wemberta Wereda face critical problem of market for their potato seed every year, which discourages the majority farmers in seed production and marketing participation; similar with the finding of (Wolday, 2002).

The FGD shows that none of the seed producer societies have marketing infrastructure facilities (Lack of storage, collection material, and processing machine), due to poor financial capacity, and lake of long-term credit service for farmers' group investment, similar with the finding of (Kirub, 2008; Berhane, 2008).

5.2 RECOMMENDATION

In a country like Ethiopia which is following agriculture development led industrialization strategy as the main development policy to ensure rapid and sustainable agricultural based development, efficient seed marketing has the potential significance to contribute for the improvement of agricultural productivity and improve the well-being of farmers in the country.

Although so many measures has been taken to improve the service efficiency of the formal seed sector (public institution) for the last five decades, farmers' access to seed was hindered by technical problems, poorly developed seed sector and rural marketing infrastructures. The formal seed sector, despite all the efforts made to improve the sector for the last five decades, it was able to supply only 10-20% of the potential demand of the country. In this respect development and promotion of small and medium sized local seed businesses at both community and private levels are a potential solution to this problem.

To stimulate the community and private seed sector that could improve seed marketing efficiency at local level, designing local seed marketing strategies based on grass-root challenges is appropriate to make the local seed business sustainable.

Therefore, based on the summarized statistical findings of the survey result on the conditions of the sector in the study areas, the following suggestions could be used as recommendation for improving the seed producer capacity to run the local seed business and for policy measures to take forward local seed business and ensure the sustainable development of local seed business activities.

1. Awareness creation program

Farmers' knowledge about existence of seed producer society in the area, importance seed business in improving household income were found significant in explaining farmers' participation in seed marketing. The study reveals that majority of the non-participant farmers were found to have no knowledge and not aware about the existence of the seed producer society, objectives and the advantages of the seed producer society for them.

Therefore, to solve this problem, awareness creation program is suggested to be designed and seed business need to be promoted using different promotional campaign activities at local level by the seed producer cooperative themselves as self-help society to promote farmers' participation. New members and Community Promotion program should be designed through continuous farmer to farmer and radio sensitization programs. Moreover, concerned bodies, be it Governmental or NGOs, should support the promotional campaign of the seed producer cooperative through technical and material capacity building to improve farmers' knowledge about seed business.

In addition, it is also necessary to encourage farmers to participate in local seed conservation activities through establishing community seed conservation system in order to motivate farmers to participate in saving locally preferred seed and make easily accessible by them which could avoid seed contamination, and stimulate farmers' awareness and participation. Governmental, NGOs and Research institutions

should support the establishment of community seed conservation system through technical and physical capacity building programs.

2. Build managerial and technical capacity of the seed producer society

Build the seed producer human resources efficiency through experts, leaders and hired staffs long-term and short-term trainings on topics: - seed producer promotion and management training, seed marketing business plan and entrepreneurial skill development and management training, seed producer enterprise governance and monitoring, auditing and financial management training. In addition, arranging exposure visit for experience sharing with other similar seed producer societies, will help the leaders and members of seed producer societies to get experience on how to run their seed business.

3. Establish Community based financial institutions

Access of household respondents to credit service was found significant in explaining farmers' participation in seed marketing. Therefore, increasing access of credit through establishment of community based financial institutions such as saving and credit cooperatives promotion is an important dual impact strategy for providing households with sustainable financial resources through promoting saving, that could enable farmers to invest in new technologies that improve their productivity and motivate them to participate in seed marketing is suggested as potential recommendation to promote sustainable local seed business in the study area.

4. Support with start up capital and long-term credit

Farmers should be encouraged to mobilize their own start up capital as share capital by organizing themselves may be under cooperatives. In addition community seed system often need financial support at the outset, including start up capital or long-term loan to cover costs for storage, processing and packaging constructions, seed purchase and marketing. Hence, supporting the community based seed producer society through start up capital or long-term loan suggested as recommendation to promote sustainable local seed business.

5. Promote Autonomous Seed Producer Cooperative system

Cooperative membership of the household respondents was found significant in explaining farmers' participation in seed marketing. Cooperatives are organizations designed to enable people to cooperate by participating in all the activities of the society to achieve common goals. The current government has created favorable political climate for cooperative movement to enhance their performance. This favorable climate should continue at all administrative levels by creating suitable work environment for the cooperatives through designing problem based technical and financial support till they become self sustainable. Since the cooperatives have a power to mobilize the majority of the country's population who live under poverty line in rural and urban areas, the government should encourage autonomous cooperative promotion geared towards motivating agribusiness activities such as local seed business development through both technical and financial support.

However, the role of governmental and non-governmental organizations should be limited on decision making power transfer and technical capacity building in helping the seed producer farmers to organize themselves to form locally operated independent small-scale cooperative seed enterprises.

6. Designed Seed Business oriented extension system

Household understanding on importance of seed business for income improvement was found significant in explaining farmers' participation in seed marketing. Studies indicate that lack of information is the major problem for poor understanding of farmers on proper utilization of new agricultural technology. Therefore, local seed business oriented extension system should be designed to improve farmers' understanding. In addition the key informants indicate that the main cause of the farmers' poor understanding about the seed business in all the areas are lack of exposure, hence designing for farmers exposure trip as experience sharing program and providing seed business training opportunities could be potential solution to promote the local seed business in a sustainable way.

7. Link Seed Producer Societies with contract farming and market information systems

Existence of contract seed farming practice in the area was found significant in explaining farmers' participation in seed marketing. Existence of functioning agricultural product markets and development of value-adding industries act as a stimulant to the improvement of agricultural productivity. However, agricultural product markets are poorly developed and price fluctuations are high in Tigray region in particular and Ethiopia in general, which may discourage farmers to participate in adopting new technologies. In this respect linking seed producer societies with contract seed farming and regular market information systems, finding ways of stimulating output markets suggested as appropriate development strategies for local seed business in the areas.

8. Support the Seed Producer Societies to establish marketing infrastructure facilities

Absence of marketing infrastructure facilities (Lack of storage, collection material, and processing machine) were the major problems that discourage farmers' and leaders of the society from promoting the seed business within their locality according the FGD. As we have observed, in reality none of the seed producer societies have marketing infrastructure facilities, due to poor financial capacity. Therefore, physical capacity building in terms of marketing infrastructure facilities through cost sharing method suggested as potential solution to stimulate the seed business at local level in the study area.

In addition the local administrative body and government should support the seed producer societies by providing land for constructing store, installing seed processing machine and office.

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7 APPENDICES

7.1 Annex 1: Different tables of descriptive statistics results

Appendix Table 1: t-test for continuous data

	non-participation		Participation				Total	
	Mean	Std. Deviation	Mean	Std. Deviation	t-value	p-value	Mean	Std. Deviation
HH Residence Distance from Market	1.3898	.47795	.9468	.54032	**-4.995*** **	**0.000**	1.1095	.55930
Respondents' Age	49.07	10.019	43.27	10.059	**-3.378*** **	**0.001**	45.40	10.396
Respondents' level of Education	1.74	2.389	2.83	2.443	**2.622** **	**0.010**	2.43	2.472
Family size	5.61	1.927	5.91	1.834	.947	.345	5.80	1.868
Land holdings in hectare	.3519	.12159	.4691	.16241	**4.605*** **	**0.000**	.4260	.15876
Average land cultivation in hectare per annum	.6250	.42753	.8683	.46420	**3.152*** **	**0.002**	.7789	.46474
Farm oxen holding	1.06	.811	1.46	.774	**3.019*** **	**0.003**	1.31	.809
Sales volume of grain in quintal	1.6296	2.04071	8.7581	6.79138	**7.509*** **	**0.000**	6.1395	6.51658
Average annual income in Birr	**7,758.33**	**3,549.31**	**12,481.08**	**5,657.12**	**5.531*** **	**0.000**	**10,746.19**	**5,473.43**
Borrowing for seed utilization in Birr	259.63	190.41	332.81	299.57	1.614	.109	305.93	266.39
Borrowing for fertilizer utilization in Birr	449.04	242.28	473.99	333.85	.480	.632	464.82	302.80
Amount of seed utilization in Kg per Year	**50.12**	**39.38**	**80.04**	**84.41**	**2.452** **	**0.015**	**69.05**	**72.54**
Amount of fertilizer utilization in Kg per Year	83.85	44.61	90.85	54.22	.803	.423	88.28	50.85
proportion of seed in your annual income in percentage	2.41	5.39	51.71	19.16	**18.465*** **	**0.000**	33.60	28.47

***, **, significant at 1%, 5% and level of significant respectively.

Appendix Table 1: Variance Inflation Factor (VIF) for continuous Explanatory variables

Model		Collinearity Statistics		
		Tolerance	VIF	R^2
1	HH Residence Distance from central Market	0.665	1.5	0.33
2	Respondents' Age	0.585	1.71	0.41
3	Respondents' level of Education	0.611	1.64	0.39
4	Respondents' Family size	0.814	1.23	0.19
5	Respondents' Land holdings in hectare	0.642	1.56	0.36
6	Average land cultivation in hectare per annum	0.318	3.15	0.68
7	Farm oxen holding	0.46	2.17	0.54
8	Sales volume of grain in quintal	0.284	3.52	0.72
9	Average annual income in Birr	0.384	2.61	0.62
10	Borrowing for seed utilization in Birr	0.128	7.81	0.87
11	Amount of seed utilization in Kg per Year	0.347	2.88	0.65
12	Amount of fertilizer utilization in Kg per Year	0.149	6.72	0.85
13	proportion of seed in your annual income in percentage	0.356	2.81	0.64

Source: Model output

Multi-collinearity effect analysis

Appendix Table 2: Correlation Matrix for both continuous and categorical explanatory variables

	Constant	Age	LandH	dlitracy	haveFO	knowing	practice cont	mkt inform	credit access	member coop	seedmkt
Constant	1	-0.42	-0.04	-0.47	-0.27	-0.19	-0.16	0.00	-0.06	-0.25	-0.27
Age		1	-0.45	0.39	-0.27	-0.52	-0.02	0.00	-0.74	-0.45	-0.29
LandH			1	0.03	-0.01	0.24	-0.09	0.00	0.29	0.16	0.00
dlitracy				1	-0.20	-0.08	-0.01	0.00	-0.18	-0.06	-0.11
haveFO					1	0.38	-0.17	0.00	0.40	0.24	0.09
knowing						1	0.03	0.00	0.58	0.30	0.20
practicecont							1	0.00	-0.04	0.16	0.17
mktinform								1	0.00	0.00	0.00
creditaccess									1	0.55	0.28
membercoop										1	0.22
seedmkt											1

Source: model output

Appendix Table 3: Multi-collinearity effect analysis using Contingency Coefficient result of cross tab analysis

	Literacy	input use	own oxen	knowing	seedpro member	training	extension	mkt infor	mrk trai	supply pract
Literate	1	0.200	0.156	0.236	0.204	0.138	0.246	0.137	0.106	0.202
input use		1	0.012	0.199	0.184	0.165	0.229	0.073	0.124	0.106
own oxen			1	0.112	0.125	0.160	0.207	0.041	0.031	0.166
knowing				1	0.592	0.506	0.572	0.278	0.314	0.362
seedpro member					1	0.630	0.639	0.365	0.398	0.403
training						1	0.608	0.332	0.356	0.361
extension							1	0.382	0.355	0.441
mkt infor								1	0.460	0.374
mrk trai									1	0.323
supply pract										1

Source: cross tab analysis output

Annex 1 Method of data Analysis

Both descriptive statistics and econometrics model were employed to study the relationship between the dependent and explanatory variables. The result obtained is used as an indicator of the relationship between dependent variable Participation of household head farmers in informal seed and the factors influencing Participation the independent variables. Moreover, econometric model were used to study the relationship between variables empirically.

Discrete regression models are models in which the dependent variable assumes dummy values. The simplest of these models is that in which the dependent variable Y is binary (it can assume only two values denoted by 0 and 1) (Amemiya 1981; Gujarati, 1988; Maddala, 1997) cited by Kirub and Birhane (2008) as well by Solomon (2009). According to these authors, the three most commonly used approaches to estimating such models are the linear probability models (LPM), the logit Model and the probit models. The linear probability model is the model, which expresses the dichotomous dependent variable (Y) as a linear function of the explanatory variable (X). Because of its computational simplicity, LPM has been used in econometrics applications especially during and before the 1960s. However as indicated by Amemiya (1981), Maddala (1997) and Gujarati (1988) the linear probability model has an obvious defect in that the estimated probability values can lie outside the normal 0-1 range. The fundamental problem with the LPM is that it is not logically very attractive model because it assumes that the marginal or incremental effect of explanatory variables remains constant, that is Pi= E (Y=1/X) increases linearly with X (Maddala, 1997; Gujarati, 1988).

The defects of the linear probability model suggest that there is a need to have an appropriate model in which the relationship between the probability that an event will occur and the explanatory variables is nonlinear (Amemiya, 1981; Gujarati, 1988 and Madalla, 1997) cited by Kirub and Birhane (2008) as well by Solomon (2009). Logit and probit Models are the convenient functional forms for models with binary endogenous variable (Johnston and Dinardo, 1997), cited by Kirub (2008). These two models are commonly used in studies involving qualitative choices.

Logistic regression is used when the response variable is a dichotomous or binary variable and the explanatory variables are continuous, categorical, or both. A dichotomous variable of the response variable takes only two values, which usually

represent the occurrence or non occurrence of some outcome events that are coded as 1or 0, respectively.

The logistic and probit formulations are quite comparable; the basic difference being that the logistic has slightly fatter tails that is the normal curve approaches the axis more quickly than the logistic curve. Therefore, the choice between the two is one of mathematical convenience and ready availability of computer programs (Gujarati, 1988) cited by kirub (2008). Both are estimated by maximum likelihood, consequently goodness of fit and inferential statistics are based on the log likelihood and chi-square test statistics. The use of chi-square test helps to decide whether two variables independent or dependent are related in a population. The test also determines if a conspicuous discrepancy exists between the observed and expected counts.

For this study, the collected data was analyzed by a statistical model "Binary Logistic Regression model "using "SPSS " version 15 computer soft ware program. In addition, descriptive statistics like mean, standard deviation, percentage, etc. were used.

Assessing the participation of farmers in seed production and supply, identifying the factors affecting the farmers' participation in primary cooperative, farmers group and community seed banks was analyzed using Binary Logistic Regression model analyses.

Problems challenges that limit non-participating farmers from becoming members of seed production and supply and suggesting suitable recommendations was identified by prioritizing the view of respondents.

The following model is the general participation model that was used to examine the issues of participation: - .

$$P_i = F(Z_i) \text{ ---------- 1}$$

$$Z_i = \beta_0 + \sum_j^n \beta j\, X_{ji} = [\log (P/1\text{-}P) = Zi = \alpha + \beta iXi + \ldots + \beta iXn], \text{ ---------- 2}$$

This is the logit model (Engleman, 1981 and Gujarati, 1988) cited by Kirub (2008)

Where, $P_i =$ the probability that an individual farmer will participate, the binary variable, $P_i = 1$ for participant farmer and $P_i = 0$ for non participant farmer.

$Z_i =$ Estimated variable for the i^{th} observation,

$F =$ the functional relationship between Pi and Z_i,

i = 1, 2… n are observations on variables for the participation model, n being the sample size 147.

X_{ji} = *the* j^{th} *explanatory variable for the* i^{th} observation, j = 1, 2 …n,

βj = *a parameter, j = 0, 1…n*

j = 0, 1…, n where n is the total number of explanatory variables

The logit model assumes the underlying index; Z_i is a random variable that predicts the probability of the farmer members to participate.

$$P_i = \frac{1}{1+ e^{-z,}} \quad \text{---------- 3}$$

the probability that a farmer will participate

$$1- P_i = \frac{1}{1+e^{zi}} \quad \text{---------- 4}$$

the probability that a farmer not participate

If the disturbance term U_i is taken into account, the logit model becomes

$$Z_i = \beta_o + \sum_{i=1}^{m} \beta_i x_i + u_i \quad \text{---------- 5}$$

In this study, the above econometric model was used to analyze the data. The model was estimated using the interactive maximum likelihood estimation procedure. This estimation procedure yields unbiased, efficient and consistent parameter estimates, particularly when the sample size is large.

The Variance Inflation Factor (VIF) was used to test for the existence of multi-collinearity between continuous explanatory variables. VIF shows how the variance of an estimator is inflated by the presence of multi-collinearity (Gujarati, 1995).

If R^2 is the adjusted square of the multiple correlation coefficients that results when the explanatory variable (X**i**) is regressed against all the other explanatory variables, VIF is computed as follows:-

VIF (X**i**) = $(1-R\ i^{2})^{-1} = 1/ (1- R\ \mathbf{i}^{2})$

As the adjusted R_i^2 approaches 1, the VIF approaches infinity. That is as the extent of collinearity increases, the variance of the estimator increases, and in the limit, it can become infinity. If there is no collinearity between regressers, the value VIF will be one. As a Rule of Thumb, values of VIF greater than 10, is often taken as a signal for the existence of multi-collinearity problem in the model (Gujarati, 1995) cited by Kirub and Birhane (2008) as well by Solomon (2009).

Contingency coefficients also calculated to see the degree of association between the dummy variables. They were calculated for each pair of dummy variables using contingency coefficient procedure available in SPSS. Contingency coefficient is chi-square based measure of association. A value of 0.75 or more indicates a stronger relationship (Healy, 1984). The contingency coefficients will be computed as follows:-

$$C = \sqrt{\frac{\chi^2}{N + \chi^2}}$$

Where, **C= coefficient of contingency, x^2= Chi-square test and N= total sample size.**

Annex 2: Interview schedule

1. PSMr - Participation in seed Marketing-
   1= participant 2=none- participant
2. DRIS-HH Residence Distance from Seed institution
3. DRM- HH Residence Distance from Market
4. RDT- HH Residence Distance from Town
5. SEX- 1=Male 2=Female
6. Age Age of hh respondents 1=14-30 2=31-45 3=46-55 4=56-70
7. Are you literate/have you attended traditional or regular school?

1= Yes 2=No

8. Edu – Education level of respondent _____
9. Edud- Education catego

1=Illiterate 2= Primary school 3= junior school (7-8 grade) 4= High school (9-12grade),

10. MRSt-Marital status

1= Married 2= Single 3= Divorced 4= widowed

11. FSd-Family size discrete

1= 1-4 2= 5-7 3= 8-9 4=>10

12. FS-Family size
13. Do have regular income? 1= Yes 2=No
14. INS-what are your main income sources?

1=Crop 2=Livestock 3=off-farm & non farm 4=Mixed farming 5=Mixed farming & off-farm 6=Crop & off-farm

15. LH-Land holdings in hectare
16. ALC-Average land cultivation in hectare per annum
17. Do you have Farm oxen? 1= Yes 2=No
18. FOH-Farm oxen holding
19. FOHd-Farm oxen holding Disc 1=1-2 2=3-4 3=none
20. CSP-Crop specialization

1= Cereals 2= Cereals & Pulses 3= Cereals, Pulses & oil seeds, Potato & some Vegetables

21. SVQ-Sales volume in quintal
    a. WSP-To whom mainly you sale your produce?

1= Private trader 2= in village market 3= Cooperative 4= I do not sell

22. RSM- Reasons for selling to market actor

1= better market price 2= Nearness 3= Nearness & better market price 4= better market service 5= it is my marketing institution 6= There is no other option 7= I do not sell

23. PGC- Do you Purchase grain for consumption?

1= Yes 2=No (if no skip to question 28)

24. WBGC- if yes, where do you buy grain for consumption?

1= Private trader 2= Village assemblers in market 3= Cooperative 4= Traders, Village assemblers in Market 5= from any, who provide me better price & service

25. RBMa- if yes, Reasons for buying from market actor

1= better market price 2= Nearness 3= Nearness & better market price 4= better market service 5= accessibility & better market service 6= There is no other option

26. AAI-Average annual income in Birr

27. AAId-Average annual income in Birr Disc

1=<=4000 2=4001-6000 3=6001-12000 4=12001-16000 5=16001-20000 6=>20001

28. FIT- Do you use farm input (fertilizer & seed)

1= Yes 2=No

29. FITC-Do you use farm input credit service?

1= Yes 2=No (if no skip to question 36)

30. SOB-Sources of borrowing

1=Cooperative 2=Microfinance 3=Cooperative & Microfinance 4=Private trader 5=relatives/ friends 6= own finance

31. RSSCT-Reasons for selecting the sources of Credit

1= better market price 2= Nearness 3= Nearness & better market price 4= better market service 5= Nearness & better market service 6= There is no other option

32. BSU-Borrowing for seed utilization in Birr

33. BFU-Borrowing for fertilizer utilization in Birr

34. ASUPH-Amount of seed utilization in Kg per Hectare

35. AFUPH-Amount of fertilizer utilization in Kg per Hectare

36. DPS -Do you produce seed?

1= Yes 2=No (if no skip to question 42)

37. HDPS-How do you produce seed?

1=in separate farm 2=Mixing with food grain 3=

38. ISPPY-Interval of seed production per year

1=once in a year 2=twice in a year 3=once in two years 4=once in three years

39. Buying price of seed in your area by the seed production promoting organizations was highly motivating to farmers to engage in seed production.

1. Strongly agree 2. Agree 3. Strongly disagree 4. Disagree

40. DGQS- if you buy seed from local market do you get quality seed? 1= Yes 2=No (if yes, skip to question 43)

41. MPBSLM-What are the major problems when you buy seed from local market? X14

1=poor quality and mixed with other grains 2=high and unfair price 3=difficult to get the seed needed in type & amount 4= All 5=

42. Do you know the existence of seed producer society? 1= Yes 2=No

43. MSPS-are you a member in seed producer society?

1= Yes 2=No (if no skip to question 48)

44. TSPS-which type of seed producer group/society?

1=Seed producer Cooperative 2=farmers group 3=community seed bank 4= I am not member of any seed producer group

45. MSPSM-who motivate you to become seed producer society member?

1=Development agents promotion 2=Development agents promotion & ESE 3= Research institution (TARI & MU) & Development agents 4=Friends/relatives promotion 6=Self initiative

46. RFM-Reasons for membership

1=Ease access & better output price 2=Easy access Credit & fair price of input 3=Ease access & better input-output price, 4=Ease access & better input-output price, good access of training & information 5=good access of training & information 6=All

47. CPFMS-constraints which prevent you from becoming member of seed producer society

1=I do not have any information about the seed producer society 2=I don't have spar land for seed production 3= drought 4=I don't see any life difference among members & non members 5= the seed producer society doesn't allow to join new members, 6= I don't have oxen & there is drought

48. CPOFFMS-constraints which prevent other farmers from becoming member of seed producer society

1= they don't have information about the society 2= lack of experience, information and suspicion on its advantage 3= shortage of oxen 4=shortage of land 5= the cooperative don't allow new members 6= shortage of land & drought 7= I have no idea

49. RMOFSPS –what do you recommend for motivating farmers to join seed producer society?

1= Provide information and promote the idea of seed business and advantage of seed producer society to all farmers. 2=establish Seed producer Cooperative, promote its advantage to all farmers & train members 3=Build seed business management capacity of the producers & promote the advantage to all farmers 4=Link the seed producer society to market, build their marketing infrastructure & capacity 5=All 6= I have no idea

50. OSPT-have you obtained seed production training?

1= Yes 2=No (if no skip to question 54)

51. TOD-Training organizer and duration 1= BoARD, 5days 2= BoARD & Mekelle university, 4-10days 3= BoARD, TARI & Mekelle university, 4-10days per year 4= BoARD, TARI, World vision & Mekelle university, 4-10days. 5= I do not know

52. RTSPM -relevance of the training to seed production and marketing

1=very much useful 2=useful 3=some times useful 4=not relevant 5=not sure 6= I have no idea

53. TSPM-What type of seed do you produce mostly?

1=Local Barely & Wheat 2=Improved Wheat & Local Barely & Wheat 3=Local Barely, Wheat & Beans, Improved Wheat 4=Local Barely, Wheat, Maize & Sorghum 5=Local Barely, Wheat & Maize, improved Maize 6= Local Barely, Wheat, Improved Wheat & potato

54. RSP- Reasons for seed production

1= to secure and use my own seed 2= to secure my self in seed & to sell to the surrounding farmers 3= to sell to BoARD/Cooperative/ on contract bases & to farmers 4= to sell through BoARD/Cooperative/ to other beneficiary

55. HDSSP- How do you start seed production?

1= from my family experience 2= based on seed focused training I have received 3= from my family experience & training received

56. PSTA- most preferred seed type in your area.

1=Local Barely & Wheat 2=Improved Wheat & Local Barely & Wheat 3=Local Barely, Wheat & Beans, Improved Wheat 4=Local Barely, Wheat, Maize & Sorghum 5=Local Barely, Wheat & Maize, improved Maize 6= Local Barely, Wheat & improved potato

57. WSBS-Who supply to you basic & certified seed?

1= BoARD 2=ESE 3= BoARD & ESE through Cooperatives 4= TARI & BoARD through Cooperatives 5=Private Seed supplier 6= I don't use basic & certified seed

58. RAIR- if you produce your own seed, do you produce only during the rain season or using irrigation also? (if you do not produce skip to question 60)

1= only once in the rainy season 2= twice a year using irrigation and rain. 3= Not Applicable/NA/

59. PSAI- proportion of seed in your annual income in percentage.

60. RSPCY- Reasons for seed price change in every year

1= growth for seed demand 2= Supply shortage in the area 3= Motivating program of seed production by BoARD and ESE 4= Drought, Demand growth & Supply shortage in the area 5= I do not understand what affects the price

61. TWYSS- To whom do you sell your seed (production)? (if you do not sell seed; skip to question 65)

1= Farmers 2=ESE 3= woreda BoARD 4= Cooperatives 5= Farmers through Cooperatives & BoARD 6= privet Traders 7= Not Applicable/NA/

62. DSaM- where do you sell your seed?

1=I sell at market center 2=I sell at Collection center for BoARD/Cooperative/ & at home to farmers 3= I sell at market center & at home to farmers 4= at home to farmers 5= I sell at Collection center for Cooperative 6= On my farm

63. WSproduce-When do you sell your seed produces?

1=immediately after harvest 2=after storing for sometime, if I need money 3=When demand exists, at time of sowing 4=immediately after harvest to Cooperative/BoARD & to Farmers when demand exists

64. CSFS-Is there practice of contract seed farming system in your area?
    1= Yes 2=No
65. CFoSeed-Do you produce seed on contract farming bases? 1= Yes 2=No (if no skip to question 68)
66. SMseed-which seed marketing, is suitable to you?

1=To sale to farmers in the local system 2=To sale in the formal (contractual) system

67. RFPCSF-If not, what is your reason for not participating in Contract seed farming?

1= I have no spar land/shortage of land 2= I was not aware & not invited to participate. 3= the price is not motivating when compared with the work of production 4= shortage of oxen 5= we are not linked to contract farming 6= Not Applicable/NA/

68. MPsSM-what are the major problems in seed marketing?

1=Unfair seed price paid by ESE & BoARD 2=Fluctuating market price 3=Fluctuating market price & no secured Market 4=Poor linkage & Poor market management capacity 5= no organized local seed marketing practice 6=All 7= shortage of land & drought

69. EpSCSM-experience in solving the challenges of the Seed marketing.

1=Store & Sell the product when the price increases 2=Sell the seed product at time of sowing 3= sale immediately after harvest 4= Not Applicable/NA/

70. DESSp-Do you get extension service for seed production and marketing?
    1=Yes 2= No (if no skip to question 75)
71. ESImpo-Is the extension service useful to the improvement of seed business?
    1= Yes 2=No 3= I have no idea
72. EXESSB-Extent of the extension service to the seed business improvement
    1=Very important 2=Some times important 3=Usually not important 4=Not important at all 5= I have no idea
73. EStime-Time interval of extension service

1=Once in a week 2=Twice in a week 3=Once in a month 4=I do not know exactly

74. Do you marketing infrastructure (common storage facilities, good access to transportation, access to marketing information services, etc) in your area? 1= Yes 2=No
75. ARoads-Do you have an access to all-weather roads? 1= Yes 2=No(if no skip to question 80)
76. Ptrans-how do you transport your product? 1=By car 2=On animals 3=both
77. Atrans-car transport availability 1=Good 2=Very Good 3= some what available 4=not available
78. Ctrans-car transport cost 1=Good 2=Very Good 3=Fair 4=not fair
79. ASMI- Do you have access to seed market information 1= Yes 2=No (if no skip to question 86)
80. MIsources-who is/are your market information sources?

1=Cooperatives 2=Traders 3=Local Government offices (BoARD, ESE & TAMPA) 4=Cooperatives & Traders 5=Self assessment in local market

81. LoMI- at what levels of the market do you receive information?

1=Local market level 2=Major markets of the region 3=Major markets of the nation

82. MOMI-which media do you get information most of the time?

1=Radio 2=TV 3=News paper 4=Telephone 5= others

83. LaCMI-language and the content of the information 1= Yes 2=No
84. IoMI-importance of market information

1= very important 2= some times important 3= usually not important 4=Not important at all 5= I am not sure

85. MAaBT-Do you receive market advice and business trainings? 1= Yes 2=No
86. Acredit-Do you have access to credit? 1= Yes 2=No (if no skip to question 92)
87. CrSIn- Credit source institution 1=Microfinance 2=SACCO 3=MP Cooperative 4=MP Cooperative & Microfinance 5= All 6= I don't use credit
88. CCPIn-Which institution has convenient credit program?

1=Microfinance 2=SACCO 3=MP Cooperative 4=MP Cooperative & Microfinance 5=none of them

89. RFCFi-Reasons for choosing the financial institutions

1= better market price 2= Nearness 3= Nearness & better market price 4= better service 5= better price & better market service 6= There is no other option

90. Member-Are you a member in any Cooperative? if you are not a member in any cooperative skip to question 97) 1= Yes 2=No

91. Membcoop- which type of cooperative?

1=MP Cooperative 2=SACCO 3=Irrigation 4=All 5= MP Cooperative & SACCO 6=not member of any cooperative

92. Coopva-what value do the cooperative add to your productivity?

1=Input and credit provision 2=Collecting and transporting products 3=Buying and selling products 4=Providing market information, training or advice 5=Storage facility 6=Input and credit provision, Providing market information, training or advice 7= 1, 2, 3 & 4 8= I see no value

93. IARP -is it possible to get input at reasonable price if you are not a member of Cooperative? 1= Yes 2=No

94. SPARP-is it possible to sell product at reasonable price if you are not a member of Cooperative? 1= Yes 2=No

95. BCGARP -is it possible to get consumer goods at reasonable price if you are not a member of Cooperative? 1= Yes 2=No

96. LSSExp-Is there local seed supply experience in your area? 1= Yes 2=No

97. WhoS-who supply the Local seed mainly in your area?

1=locally recognized individual farmers for their quality seed production 2=Farmers organized as seed producer Cooperatives 3=Farmers organized under seed producer groups 4=none

98. VSLSS-Varieties are supplied under the local seed sector

1= previously introduced as improved seed, & retained by the farmers 2=locally selected by the farmer's knowledge 3= both introduced as improved & locally selected varieties 4=none

99. DSSLFa-Do you supply seed locally to farmers? 1= Yes 2=No (if no skip to question 107)

100. HoSseed-how do you select and harvest the seed?

1=based on my traditional Experience 2=I was trained by the BoARD 3=based on my traditional Experience & Training by the BoARD

101. MStorag-What method of storage do you use?

1=Traditional storage method 2=Intermediate storage method introduced by BoARD

102. KnPref-how do you know the Preference of the farmer's?

1=Based on my previous Experience 2=The DA of the area support me technically 3=Based on my previous Experience & Technical support of DA

103. FPrice-how do you fix the price for seed product? 1=Based on the surrounding market price for the product 2=Based on the demand of the farmer for the product 3= The BoARD fix the price of improved Seed & for local seed based on market price 4=Based on the surrounding market price & demand of the farmer for the product

104. DSC-do you sell seed in cash? 1=I sale in cash 2=I exchange with food grain 3= both in Cash & exchange with food grain

105. MPSf- how do you evaluate the market price of seed in encouraging the producer?

1= very attractive 2= attractive 3=not attractive 4= I have no idea

106. DTSim-Do you think local seed marketing can improve the producer income? 1= Yes 2=No 3= I have no idea

107. HSMim-If your answer is yes, how local seed marketing can improve the producer income? 1= the price for seed is higher than the price of food grains, 2= the seed producer exchange 1kg seed by 1.5kg of food grain 3= the seed producer sales the seed when the price reaches at high price during planting time 4= all 5= I have no Idea 6=

108. OppLSP-Opportunity for local seed production 1=existence of supportive projects 2=shortage of both local & improved seed at local market 3=existence of DA & readiness of local Administrative body 4=Technical support from Research institutions, BoARD& Universities 5=establishment of seed producer cooperatives 6=All 7= I have no idea

109. MFLSP-measure is needed to take forward the local seed production 1=Establish Seed producer Cooperative, promote the advantage to all farmers & Train members 2= promote the advantage of seed to all farmers & Build seed business management capacity of the producers 3=Link the seed producer society to market, build their marketing infrastructure 4=All 5= I have no idea

110. ExpSB-Do you like to expand the seed business? 1= Yes 2=No 3= I have no idea

Questionnaire for officials B

Name of the official _____

Position _____

Experience_____

1. What are the potentials of seed marketing?

S/n	Potentials	Rank	Suggestions
1			
2			
3			
4			

2. Please identify the major problems in seed marketing in your Woreda

S/n	Problem	Rank	Suggestions
1			
2			
3			
4			

3. What are the technical problems?

1._____

2._____

3._____

4. What are the managerial problems?

1._____

2._____

3._____

5. What are the infrastructural problems?

1._____

2._____

3._____

6. Any other problems

1._____

2._____

3._____

7. What is your suggestion to overcome the above problems?

S/N	Problems	Suggestions
1	Technical	1) 2)
2	Managerial	1) 2)
3	Infrastructural	1) 2)
4	Others specify	1) 2)

Focus Group Discussion

Checklist for focus group discussion

1. In your area when does seed supply started?
2. Who are the main seed suppliers in your area?
3. Is there nay farmer based seed producer organization (Cooperative, farmers' group or community seed bank) involved in seed supply in your area?
4. If one of the above farmer based organization exit in your area, who take the initiation and promotion for the establishment of the above seed producer societies?
5. Is there membership growth in the above seed producer societies, as compared with the starting time?
6. Is there member withdrawal from the above seed producer societies? What is the main reason for members' withdrawal?
7. What kind of benefits did the members of seed producer societies received from the seed producer societies?
8. Are there farmers who have acceptance and known for their local seed production? If they are there, how they produce and what kind of seed mostly they produce?
9. How do you evaluate formal seed supply and marketing in your area, in-terms of price, quality and on time delivery?
10. How do you evaluate informal (local) seed supply and marketing in your area, in-terms of price, quality and on time accessibility?
11. How do you evaluate input and credit service facilities in terms of marketing infrastructure and facilities, and do you think farmers have access to the required seed supply on time?
12. How do you evaluate the capacity of the input/seed suppliers in terms of fulfilling the demand, accountability on their supply and simplicity of supply procedure?
13. How do you evaluate the members of the farmer based seed producer organizations (Cooperative, farmers' group or community seed bank members) level of understanding on the objectives and purposes of their seed producer organizations and their participation?
14. which type and variety of seed is most preferred in your area? What are the main reasons for the preference the specified type and variety of seed?

15. Do you think local seed conservation is important? Why and how can be done local seed conservation?
16. Are there farmers who produce seed on contract farming? If yes, for whom they produce? What is the base of the contract seed farming?
17. What kinds of criteria need the farmer to fulfill in order to participate in the seed business?
18. What are the major problems in seed supply and seed marketing in your area?
19. What kind of solutions do you propose for the major problems of seed supply and seed marketing you mentioned above?
20. Do you have any important issue related to seed supply and seed marketing you want to mention different from the above?